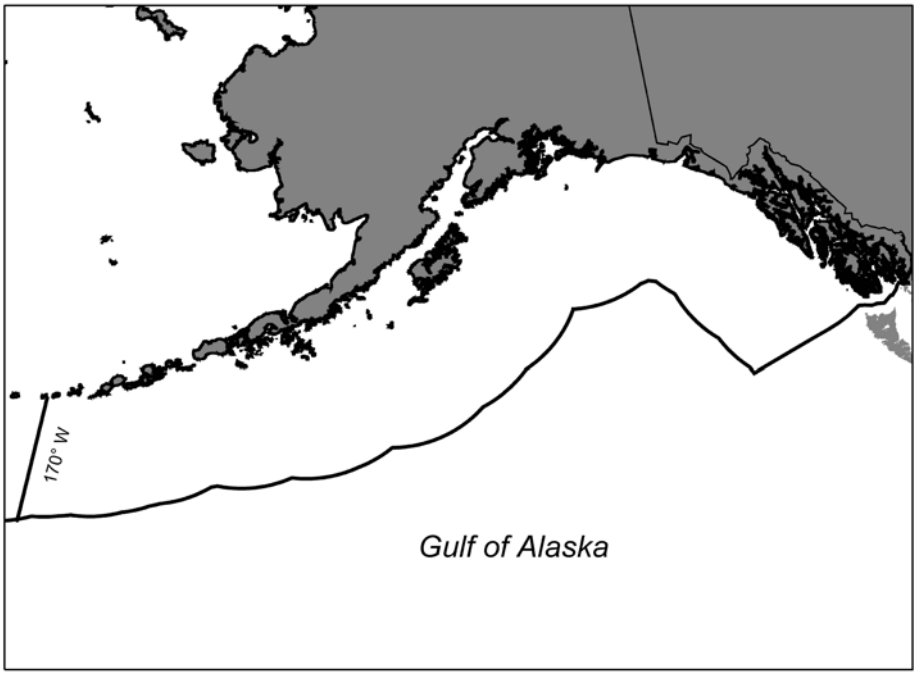
FISHERY MANAGEMENT PLAN

for Groundfish of the Gulf of Alaska



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Executive Summary

This Fishery Management Plan (FMP) governs groundfish fisheries of the Gulf of Alaska (GOA). The FMP management area is the United States (U.S.) exclusive economic zone (EEZ) of the North Pacific Ocean, exclusive of the Bering Sea, between the eastern Aleutian Islands at 170° W. longitude and Dixon Entrance at 132°40' W. longitude. The FMP covers fisheries for all stocks of finfish except salmon, steelhead, Pacific halibut, Pacific herring, and tuna.

This FMP was implemented on December 1, 1978. Since that time, it has been amended over sixty times, and its focus has changed from the regulation of mainly foreign fisheries to the management of fully domestic groundfish fisheries. This new version of the FMP has been revised to remove or update obsolete references to foreign fishery management measures, as well as outdated catch data and other scientific information. The FMP has also been reorganized to provide readers with a clear understanding of the GOA groundfish fishery and conservation and management measures promulgated by the FMP.

ES.1 Management Policy

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) is the primary domestic legislation governing management of the nation's marine fisheries. In 1996, the United States Congress reauthorized the Magnuson-Stevens Act to include, among other things, a new emphasis on the precautionary approach in U.S. fishery management policy. The Magnuson-Stevens Act contains ten national standards, with which all FMPs must conform and which guide fishery management. Besides the Magnuson-Stevens Act, U.S. fisheries management must be consistent with the requirements of other regulations including the Marine Mammal Protection Act, the Endangered Species Act, the Migratory Bird Treaty Act, and several other Federal laws.

Under the Magnuson-Stevens Act, the North Pacific Fishery Management Council (Council) is authorized to prepare and submit to the Secretary of Commerce for approval, disapproval or partial approval, a FMP and any necessary amendments, for each fishery under its authority that requires conservation and management. The Council conducts public hearings so as to allow all interested persons an opportunity to be heard in the development of FMPs and amendments, and reviews and revises, as appropriate, the assessments and specifications with respect to the optimum yield from each fishery (16 U.S.C. 1852(h)).

The Council has developed a management policy and objectives to guide its development of management recommendations to the Secretary of Commerce. This management approach is described in Table ES-1.

Table ES-1 GOA Groundfish Fisheries Management Approach

The Council's policy is to apply judicious and responsible fisheries management practices, based on sound scientific research and analysis, proactively rather than reactively, to ensure the sustainability of fishery resources and associated ecosystems for the benefit of future, as well as current generations. The productivity of the North Pacific ecosystem is acknowledged to be among the highest in the world. For the past 25 years, the Council management approach has incorporated forward looking conservation measures that address differing levels of uncertainty. This management approach has in recent years been labeled the precautionary approach. Recognizing that potential changes in productivity may be caused by fluctuations in natural oceanographic conditions, fisheries, and other, non-fishing activities, the Council intends to continue to take appropriate measures to insure the continued sustainability of the managed species. It will carry out this objective by considering reasonable, adaptive management measures, as described in the Magnuson-Stevens Act and in conformance with the National Standards, the Endangered Species Act, the National Environmental Policy Act, and other applicable law. This management approach takes into account the National Academy of Science's recommendations on Sustainable Fisheries Policy.

As part of its policy, the Council intends to consider and adopt, as appropriate, measures that accelerate the Council's precautionary, adaptive management approach through community-based or rights-based management, ecosystem-based management principles that protect managed species from overfishing, and where appropriate and practicable, increase habitat protection and bycatch constraints. All management measures will be based on the best scientific information available. Given this intent, the fishery management goal is to provide sound conservation of the living marine resources; provide socially and economically viable fisheries for the well-being of fishing communities; minimize human-caused threats to protected species; maintain a healthy marine resource habitat; and incorporate ecosystem-based considerations into management decisions.

This management approach recognizes the need to balance many competing uses of marine resources and different social and economic goals for sustainable fishery management, including protection of the long-term health of the resource and the optimization of yield. This policy will use and improve upon the Council's existing open and transparent process of public involvement in decision-making.

ES.2 Summary of Management Measures

The management measures that govern the Gulf of Alaska groundfish fishery are summarized in Table ES-2.

Pursuant to Title II of the Magnuson-Stevens Act, there is no allowable level of foreign fishing for the groundfish fisheries covered by this FMP. Fishing vessels and fish processors of the U.S. have the capacity to harvest and process up to the level of optimum yield of all species subject to this FMP.

Table ES-2 Summary of Management Measures for the GOA Groundfish Fishery

Management Area	U.S. exclusive economic zone (EEZ) of the North Pacific Ocean, exclusive of the Bering Sea, between the eastern Aleutian Islands at 170° W. longitude and Dixon Entrance at 132°40' W. longitude. **Regulatory areas**: Three regulatory areas are defined in the Gulf of Alaska: Eastern, extending from Dixon Entrance to 147° W. longitude; Central, extending between 147° W. and 159° W. longitude, and Western, extending between 159° W. and 170° W. longitude.
Stocks	All finfish, except salmon, steelhead, halibut, herring, and tuna, which are distributed or exploited in the management area, and are listed in Table 3-1. Those stocks and stock complexes that are commercially important and for which an annual TAC is established include: walleye pollock, Pacific cod, sablefish, shallow and deep water flatfish, rex sole, flathead sole, arrowtooth flounder, Pacific ocean perch, shortraker/rougheye rockfish, northern rockfish, "other slope" rockfish, pelagic shelf rockfish, demersal shelf rockfish, thornyhead rockfish, Atka mackerel, and skates.
Optimum Yield (OY) and Maximum Sustainable Yield (MSY)	The OY of the GOA groundfish complex (consisting of stocks listed in the 'target species' and 'other species' categories, as listed in Table 3-1) is in the range of 116,000 to 800,000 mt. The upper end of the range is derived from historical estimates of MSY.
Procedure to set Total Allowable Catch (TAC)	Based on the annual Stock Assessment and Fishery Evaluation (SAFE) report, the Council will recommend to the Secretary of Commerce TACs and apportionments thereof for each target species. TAC for the "other species" category will be set at 5% of the summed target species TACs. Up to two years of TACs may be established for certain species. **Reserve**: 20% of the TAC for pollock, Pacific cod, flatfish, and the "other species" category is set aside to form the reserve, which may be reapportioned to these fisheries at any time and in any amount by the Regional Administrator.
Apportionment of TAC	Harvest allocations and management are based on the calendar year. TACs are apportioned by regulatory area, and by district for some stocks. Areas or districts may also be managed together. **Pollock**: the Western and Central regulatory areas are combined, and annual TACs are divided into seasonal allowances. 100% of the TAC is allocated to the inshore sector. **Pacific cod**: TAC shall be allocated 90% to the inshore sector and 10% to the offshore sector. **Sablefish**: the Eastern regulatory area is divided into two districts, West Yakutat and Southeast Outside. In the Eastern regulatory area, vessels using hook-and-line gear will be permitted to take up to 95% of the TAC, and vessels using trawl gear up to 5%. In the Western and Central regulatory areas, vessels using hook-and-line gear will be permitted to take up to 80% of the TAC, and vessels using trawl gear up to 20%. **Rockfish**: the Eastern regulatory area is divided into two districts, West Yakutat and Southeast Outside.
Attainment of TAC	The attainment of a TAC for a species will result in the closure of the target fishery for that species. Further retention of that species will be prohibited.
Permit	All vessels participating in the GOA groundfish fisheries, other than fixed gear sablefish and demersal shelf rockfish in Southeast Outside district, require a Federal groundfish license, except for: vessels fishing in State of Alaska waters and vessels less than 26' LOA. Licenses are endorsed with area, gear, and vessel type and length designations. Fishing permits may be authorized, for limited experimental purposes, for the target or incidental harvest of groundfish that would otherwise be prohibited.
Participation Restrictions	**American Fisheries Act** (AFA): Vessels or processors participating in the Bering Sea and Aleutian Islands pollock fishery authorized under the AFA are subject to harvesting and processing sideboard restrictions on GOA groundfish.
Authorized Gear	Gear types authorized by the FMP are trawls, hook-and-line, pots, jigs, and other gear as defined in regulations. **Sablefish**: Legal gear for taking sablefish in the GOA is hook and line and trawl gear.

Table ES-2 Summary of Management Measures for the GOA Groundfish Fishery

Time and Area Restrictions	**Fishing Year**: January 1-December 31. **All vessels**: Fishing or anchoring within the Sitka Pinnacles Marine Reserve is prohibited at all times. **All trawl:** Use of trawl gear is prohibited at all times in the Southeast Outside district. **Non-pelagic trawl**: The use of non-pelagic trawl is prohibited in Cook Inlet. Three types of closure areas are designated around Kodiak Island. Type I areas prohibit non-pelagic trawling year-round; Type II prohibit non-pelagic trawl from February 15 to June 15; adjacent areas designated as Type III may be reclassified by the Regional Administrator as Type I or Type II following a recruitment event. **Marine mammal measures**: Regulations implementing the FMP may include conservation measures that temporally and spatially limit fishing effort around areas important to marine mammals. **Gear test area exemption**: Specific gear test areas for use when the fishing grounds are closed to that gear type, are established in regulations that implement the FMP.
Prohibited Species	Pacific halibut, Pacific herring, Pacific salmon, steelhead trout, king crab, and Tanner crab are prohibited species and must be returned to the sea with a minimum of injury except when their retention is authorized by other applicable law. Groundfish species and species under this FMP for which the TAC has been achieved shall be treated in the same manner as prohibited species.
Prohibited Species Catch (PSC) Limits	The attainment of a PSC limit for a species will result in the closure of the appropriate fishery. **Pacific halibut**: Halibut mortality PSC limits are established annually in regulation; may be apportioned by season, regulatory area, gear type, and/or target fishery.
Retention and Utilization Requirements	**Pollock**: Roe-stripping is prohibited; see also Improved Retention/Improved Utilization Program (IR/IU). **IR/IU**: All pollock and Pacific cod must be retained and processed.
Bycatch Reduction Programs	**Shallow water Flatfish:** The Council will annually review the GOA fisheries that exceed a discard rate of 5% of shallow water flatfish, and may propose management measures to reduce bycatch in these fisheries.
Fixed Gear Sablefish Fishery	The directed fixed gear sablefish fisheries are managed under an Individual Fishing Quota program. The FMP specifies requirements for the initial allocation of quota share in 1995, as well as transfer, use, ownership, and general provisions. **Annual Allocation**: The ratio of a person's quota share to the quota share pool is multiplied by the fixed gear TAC (adjusted for the community development quota allocation - see below), to arrive at the annual individual fishing quota. **Community Quota Share Purchases**: Specified GOA coastal communities are eligible to hold commercial catcher boat sablefish quota share under the IFQ program.
Delegated Authority	**Demersal shelf rockfish:** Managed by the State of Alaska under Council oversight. The Council retains the responsibility of setting the demersal shelf rockfish harvest level.
Flexible Authority	The Regional Administrator of NMFS is authorized to make inseason adjustments through gear modifications, closures, or fishing area/quota restrictions, for conservation reasons, to protect identified habitat problems, or to increase vessel safety.
Recordkeeping and Reporting	Recordkeeping that is necessary and appropriate to determine catch, production, effort, price, and other information necessary for conservation and management may be required. May include the use of catch and/or product logs, product transfer logs, effort logs, or other records as specified in regulations. **At-sea processor vessels**: Catcher/processor vessels and mothership processors vessels may be required to submit check-in and check-out reports for any Federal statistical areas or the U.S. EEZ.
Observer Program	U.S. fishing vessels that catch groundfish in the EEZ, or receive groundfish caught in the EEZ, and shoreside processors that receive groundfish caught in the EEZ, are required to accommodate NMFS-certified observers as specified in regulations, in order to verify catch composition and quantity, including at-sea discards, and collect biological information on marine resources.
Evaluation and Review of the FMP	The Council will maintain a continuing review of the fisheries managed under this FMP, and all critical components of the FMP will be reviewed periodically. **Management Policy**: Objectives in the management policy statement will be reviewed annually. **Essential Fish Habitat (EFH)**: The Council will conduct a complete review of EFH once every 5 years, and in between will solicit proposals on Habitat Areas of Particular Concern and/or conservation and enhancement measures to minimize potential adverse effects from fishing. Annually, EFH information will be reviewed in the "Ecosystems Considerations" chapter of the SAFE.

ES.3 Organization of the FMP

The FMP is organized into six chapters. Chapter 1 contains an introduction to the FMP, and Chapter 2 describes the policy and management objectives of the FMP.

Chapter 3 contains the conservation and management measures that regulate the GOA groundfish fisheries. Section 3.1 denotes the area and stocks governed by the FMP, and describes the five categories of species or species groups likely to be taken in the groundfish fishery. Section 3.2 specifies the procedures for determining harvest levels for the groundfish species, and includes the maximum sustainable yield and optimum yield of the groundfish complex. Sections 3.3 to 3.6 contain permit and participation, gear, time and area, and catch restrictions for the groundfish fisheries, respectively. Section 3.7 describes the specific management measures for the quota share program in place in the fixed gear sablefish fishery. Measures that allow flexible management authority are addressed in Section 3.8, and Section 3.9 designates monitoring and reporting requirements for the fisheries. Section 3.10 describes the schedule and procedures for review of the FMP or FMP components.

Chapter 4 contains a description of the stocks and their habitat (including essential fish habitat definitions), fishing activities, the economic and socioeconomic characteristics of the fisheries and communities, and ecosystem characteristics. Additional descriptive information is also contained in the appendices. Chapter 5 specifies how relationship of the FMP with applicable law and other fisheries. Chapter 6 references additional sources of material on the groundfish fisheries, and includes the bibliography.

Appendices to the FMP include supplemental information. Appendix A contains a summary of its amendments. Appendix B describes the geographical coordinates for the areas specified in the FMP. Appendix C incorporates sections of the American Fisheries Act that are referenced in the GOA groundfish fishery management measures. Appendices D, E, and F include, respectively, habitat information by life stage for managed species, maps of essential fish habitat, and a discussion of adverse effects on essential fish habitat. Appendix G summarizes FMP impacts on fishery participants and fishing communities. Appendix H examines research needs in the GOA groundfish fisheries. Appendix I includes information about marine mammals and seabirds interacting with the GOA groundfish fisheries, including species listed under the Endangered Species Act.

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List of Tables and Figures

Acronyms and Abbreviations Used in the FMP

‘	minutes
%	percent
ABC	acceptable biological catch
ADF&G	Alaska Department of Fish and Game
AFA	American Fisheries Act
AFSC	Alaska Fisheries Science Center (of the National Marine Fisheries Service)
AI	Aleutian Islands
ALT	Alaska Local Time
AP	North Pacific Fishery Management Council’s Advisory Panel
B	biomass
BSAI	Bering Sea and Aleutian Islands
$B_{x\%}$	biomass that results from a fishing mortality rate of $F_{x\%}$
C	Celsius or Centigrade
C.F.R.	Code of Federal Regulations
CDP	community development plan
CDQ	community development quota
cm	centimeter(s)
COBLZ	*C. Opilio* Bycatch Limitation Zone
Council	North Pacific Fishery Management Council
CVOA	catcher vessel operational area
DAH	domestic annual harvest
DAP	domestic annual processed catch
DSR	demersal shelf rockfish
E.	East
EEZ	exclusive economic zone
EFH	essential fish habitat
ENSO	El Niño-Southern Oscillation
ESA	Endangered Species Act
F	fishing mortality rate
FMP	fishery management plan
FOCI	Fisheries-Oceanography Coordinated Investigations
ft	foot/feet
$F_{x\%}$	fishing mortality rate at which the SPR level would be reduced to *X%* of the SPR level in the absence of fishing
GHL	guideline harvest level
GMT	Greenwich mean time
HAPC	habitat area of particular concern
IFQ	individual fishing quota
IPHC	International Pacific Halibut Commission
IR/IU	Improved Retention/Improved Utilization Program
JVP	Joint venture processed catch
kg	kilogram(s)
km	kilometer(s)
lb	pound(s)
LLP	licence limitation program
LOA	length overall
m	meter(s)
M	natural mortality rate
Magnuson-Stevens Act	Magnuson-Stevens Fishery Conservation and Management Act
mm	millimeter(s)
MMPA	Marine Mammal Protection Act
MSY	maximum sustainable yield
mt	metric ton(s)
N.	North
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPFMC	North Pacific Fishery Management Council
OFL	overfishing level
OY	optimum yield
PBR	potential biological removal
pdf	probablity density function
POP	Pacific ocean perch
ppm	part(s) per million
ppt	part(s) per thousand
PRD	Protected Resources Division (of the National Marine Fisheries Service)
PSC	prohibited species catch
QS	quota share(s)
RKCSA	Red King Crab Savings Area
S.	South
SAFE	Stock Assessment and Fishery Evaluation
SPR	spawning per recruit
SSC	North Pacific Fishery Management Council’s Scientific and Statistical Committee
TAC	total allowable catch
TALFF	total allowable level of foreign fishing
U.S.	United States
U.S.C.	United States Code
USFWS	United States Fish and Wildlife Service
U.S. GLOBEC	United States Global Ocean Ecosystems Dynamics
USSR	United Soviet Socialist Republics
W.	West
°	degrees

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Chapter 1 Introduction

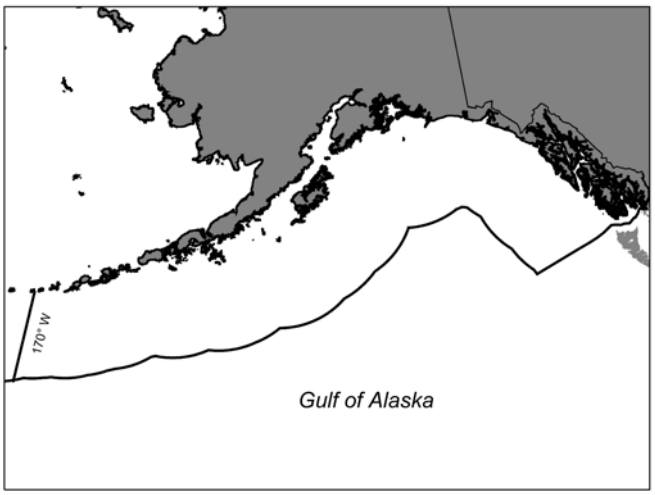
This Fishery Management Plan (FMP) governs groundfish fisheries of the Gulf of Alaska (GOA). The geographical extent of the FMP management unit is the United States (U.S.) Exclusive Economic Zone (EEZ) of the North Pacific Ocean, exclusive of the Bering Sea, between the eastern Aleutian Islands at 170° W. longitude and Dixon Entrance at 132°40' W. longitude (Figure 1-1).

This FMP was implemented on December 1, 1978. Since that time, it has been amended over sixty times, and its focus has changed from the regulation of mainly foreign fisheries to the management of fully domestic groundfish fisheries.

The FMP covers fisheries for all stocks of finfish except salmon, steelhead, Pacific halibut, Pacific herring, and tuna. In terms of both the fishery and the groundfish resource, the GOA groundfish fishery forms a distinct management unit. The history of fishery development, target species and species composition of the commercial catch, bathymetry, and oceanography are all much different in the GOA than in the adjacent Bering Sea and Aleutian Islands (BSAI) management area or British Columbia to California regions. Although many species occur over a broader range than the GOA management area, with only a few exceptions (e.g., sablefish), stocks of common species in this region are believed to be different from those in the adjacent BSAI.

The International Pacific Halibut Commission is responsible for management of the North American Pacific halibut fishery, under the authority of the Convention for the Preservation of the Halibut Fishery of the North Pacific Ocean and the Bering Sea. The potential adverse impact on halibut from the groundfish fisheries is such that it must be taken into account in the management of the groundfish fishery. Therefore, certain pertinent aspects of the halibut resource and the directed fishery it supports are described in this FMP. Throughout this document, the term “groundfish” excludes Pacific halibut.

Figure 1-1 Management Area for the Fishery Management Plan for Groundfish of the Gulf of Alaska.



1.1 Foreign Fishing

Title II of the Magnuson-Stevens Act establishes the system for the regulation of foreign fishing within the U.S. EEZ. These regulations are published in 50 CFR 600. The regulations provide for the setting of a total allowable level of foreign fishing (TALFF) for species based on the portion of the optimum yield that will not be caught by U.S. vessels. At the present time, no TALFF is available for the fisheries covered by this FMP, because the U.S. has the capacity to harvest up to the level of optimum yield of all species subject to this FMP. Also, U.S. fish processors have the capacity to process all of the optimum yield of GOA groundfish.

Chapter 2 Management Policy and Objectives

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) is the primary domestic legislation governing management of the nation's marine fisheries. In 1996, the United States Congress reauthorized the Magnuson-Stevens Act to include, among other things, a new emphasis on the precautionary approach in U.S. fishery management policy. The Magnuson-Stevens Act contains ten national standards, with which all fishery management plans (FMPs) must conform and which guide fishery management. The national standards are listed in Section 2.1, and provide the primary guidance for the management of the groundfish fisheries.

Under the Magnuson-Stevens Act, the North Pacific Fishery Management Council (Council) is authorized to prepare and submit to the Secretary of Commerce for approval, disapproval or partial approval, a FMP and any necessary amendments, for each fishery under its authority that requires conservation and management. The Council conducts public hearings so as to allow all interested persons an opportunity to be heard in the development of FMPs and amendments, and reviews and revises, as appropriate, the assessments and specifications with respect to the optimum yield from each fishery (16 U.S.C. 1852(h)).

The Council has developed a management policy and objectives to guide its development of management recommendations to the Secretary of Commerce for the Gulf of Alaska (GOA) groundfish fisheries. This management approach is described in Section 2.2.

2.1 National Standards for Fishery Conservation and Management

The Magnuson-Stevens Fishery Conservation and Management Act, as amended, sets out ten national standards for fishery conservation and management (16 U.S.C. § 1851), with which all fishery management plans must be consistent.

1. Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry.
2. Conservation and management measures shall be based upon the best scientific information available.
3. To the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination.
4. Conservation and management measures shall not discriminate between residents of different States. If it becomes necessary to allocate or assign fishing privileges among various United States fishermen, such allocation shall be A) fair and equitable to all such fishermen; B) reasonably calculated to promote conservation; and C) carried out in such manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges.
5. Conservation and management measures shall, where practicable, consider efficiency in the utilization of fishery resources; except that no such measure shall have economic allocation as its sole purpose.
6. Conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches.

7. Conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication.

8. Conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities in order to A) provide for the sustained participation of such communities, and B) to the extent practicable, minimize adverse economic impacts on such communities.

9. Conservation and management measures shall, to the extent practicable, A) minimize bycatch and B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.

10. Conservation and management measures shall, to the extent practicable, promote the safety of human life at sea.

2.2 Management Approach for the GOA Groundfish Fisheries

The Council's policy is to apply judicious and responsible fisheries management practices, based on sound scientific research and analysis, proactively rather than reactively, to ensure the sustainability of fishery resources and associated ecosystems for the benefit of future, as well as current generations. The productivity of the North Pacific ecosystem is acknowledged to be among the highest in the world. For the past 25 years, the Council management approach has incorporated forward looking conservation measures that address differing levels of uncertainty. This management approach has in recent years been labeled the precautionary approach. Recognizing that potential changes in productivity may be caused by fluctuations in natural oceanographic conditions, fisheries, and other, non-fishing activities, the Council intends to continue to take appropriate measures to insure the continued sustainability of the managed species. It will carry out this objective by considering reasonable, adaptive management measures, as described in the Magnuson-Stevens Act and in conformance with the National Standards, the Endangered Species Act (ESA), the National Environmental Policy Act, and other applicable law. This management approach takes into account the National Academy of Science's recommendations on Sustainable Fisheries Policy.

As part of its policy, the Council intends to consider and adopt, as appropriate, measures that accelerate the Council's precautionary, adaptive management approach through community-based or rights-based management, ecosystem-based management principles that protect managed species from overfishing, and where appropriate and practicable, increase habitat protection and bycatch constraints. All management measures will be based on the best scientific information available. Given this intent, the fishery management goal is to provide sound conservation of the living marine resources; provide socially and economically viable fisheries for the well-being of fishing communities; minimize human-caused threats to protected species; maintain a healthy marine resource habitat; and incorporate ecosystem-based considerations into management decisions.

This management approach recognizes the need to balance many competing uses of marine resources and different social and economic goals for sustainable fishery management, including protection of the long-term health of the resource and the optimization of yield. This policy will use and improve upon the Council's existing open and transparent process of public involvement in decision-making.

2.2.1 Management Objectives

Adaptive management requires regular and periodic review. Objectives identified in this policy statement will be reviewed annually by the Council. The Council will also review, modify, eliminate, or consider new issues, as appropriate, to best carry out the goals and objectives of this management policy.

To meet the goals of this overall management approach, the Council and National Marine Fisheries Service (NMFS) will use the Alaska Groundfish Fisheries Programmatic Supplemental Environmental Impact Statement (NMFS 2004) as a planning document. To help focus consideration of potential management measures, the Council and NMFS will use the following objectives as guideposts, to be re-evaluated, as amendments to the FMP are considered over the life of the analysis.

Prevent Overfishing:

1. Adopt conservative harvest levels for multi-species and single species fisheries and specify optimum yield.
2. Continue to use the existing optimum yield cap for the GOA groundfish fisheries.
3. Provide for adaptive management by continuing to specify optimum yield as a range.
4. Provide for periodic reviews of the adequacy of F_{40} and adopt improvements, as appropriate.
5. Continue to improve the management of species through species categories.

Promote Sustainable Fisheries and Communities:

6. Promote conservation while providing for optimum yield in terms of the greatest overall benefit to the nation with particular reference to food production, and sustainable opportunities for recreational, subsistence, and commercial fishing participants and fishing communities.
7. Promote management measures that, while meeting conservation objectives, are also designed to avoid significant disruption of existing social and economic structures.
8. Promote fair and equitable allocation of identified available resources in a manner such that no particular sector, group or entity acquires an excessive share of the privileges.
9. Promote increased safety at sea.

Preserve Food Web:

10. Develop indices of ecosystem health as targets for management.
11. Improve the procedure to adjust acceptable biological catch levels as necessary to account for uncertainty and ecosystem factors.
12. Continue to protect the integrity of the food web through limits on harvest of forage species.
13. Incorporate ecosystem-based considerations into fishery management decisions, as appropriate.

Manage Incidental Catch and Reduce Bycatch and Waste:

14. Continue and improve current incidental catch and bycatch management program.
15. Develop incentive programs for bycatch reduction including the development of mechanisms to facilitate the formation of bycatch pools, vessel bycatch allowances, or other bycatch incentive systems.

16. Encourage research programs to evaluate current population estimates for non-target species with a view to setting appropriate bycatch limits, as information becomes available.
17. Continue program to reduce discards by developing management measures that encourage the use of gear and fishing techniques that reduce bycatch which includes economic discards.
18. Continue to manage incidental catch and bycatch through seasonal distribution of total allowable catch and geographical gear restrictions.
19. Continue to account for bycatch mortality in total allowable catch accounting and improve the accuracy of mortality assessments for target, prohibited species catch, and non-commercial species.
20. Control the bycatch of prohibited species through prohibited species catch limits or other appropriate measures.
21. Reduce waste to biologically and socially acceptable levels.

Avoid Impacts to Seabirds and Marine Mammals:

22. Continue to cooperate with the U.S. Fish and Wildlife Service (USFWS) to protect ESA-listed species, and if appropriate and practicable, other seabird species.
23. Maintain or adjust current protection measures as appropriate to avoid jeopardy of extinction or adverse modification of critical habitat for ESA-listed Steller sea lions.
24. Encourage programs to review status of endangered or threatened marine mammal stocks and fishing interactions and develop fishery management measures as appropriate.
25. Continue to cooperate with NMFS and USFWS to protect ESA-listed marine mammal species, and if appropriate and practicable, other marine mammal species.

Reduce and Avoid Impacts to Habitat:

26. Review and evaluate efficacy of existing habitat protection measures for managed species.
27. Identify and designate essential fish habitat and habitat areas of particular concern pursuant to Magnuson-Stevens Act rules, and mitigate fishery impacts as necessary and practicable to continue the sustainability of managed species.
28. Develop a Marine Protected Area policy in coordination with national and state policies.
29. Encourage development of a research program to identify regional baseline habitat information and mapping, subject to funding and staff availability.
30. Develop goals, objectives and criteria to evaluate the efficacy and suitable design of marine protected areas and no-take marine reserves as tools to maintain abundance, diversity, and productivity. Implement marine protected areas if and where appropriate.

Promote Equitable and Efficient Use of Fishery Resources:

31. Provide economic and community stability to harvesting and processing sectors through fair allocation of fishery resources.
32. Maintain the licence limitation program, modified as necessary, and further decrease excess fishing capacity and overcapitalization by eliminating latent licences and extending programs such as community or rights-based management to some or all groundfish fisheries.

33. Provide for adaptive management by periodically evaluating the effectiveness of rationalization programs and the allocation of access rights based on performance.
34. Develop management measures that, when practicable, consider the efficient use of fishery resources taking into account the interest of harvesters, processors, and communities.

Increase Alaska Native Consultation:

35. Continue to incorporate local and traditional knowledge in fishery management.
36. Consider ways to enhance collection of local and traditional knowledge from communities, and incorporate such knowledge in fishery management where appropriate.
37. Increase Alaska Native participation and consultation in fishery management.

Improve Data Quality, Monitoring and Enforcement:

38. Increase the utility of groundfish fishery observer data for the conservation and management of living marine resources.
39. Develop funding mechanisms that achieve equitable costs to the industry for implementation of the North Pacific Groundfish Observer Program.
40. Improve community and regional economic impact costs and benefits through increased data reporting requirements.
41. Increase the quality of monitoring and enforcement data through improved technology.
42. Encourage a coordinated, long-term ecosystem monitoring program to collect baseline information and compile existing information from a variety of ongoing research initiatives, subject to funding and staff availability.
43. Cooperate with research institutions such as the North Pacific Research Board in identifying research needs to address pressing fishery issues.
44. Promote enhanced enforceability.
45. Continue to cooperate and coordinate management and enforcement programs with the Alaska Board of Fish, Alaska Department of Fish and Game, and Alaska Fish and Wildlife Protection, the U.S. Coast Guard, NMFS Enforcement, International Pacific Halibut Commission, Federal agencies, and other organizations to meet conservation requirements; promote economically healthy and sustainable fisheries and fishing communities; and maximize efficiencies in management and enforcement programs through continued consultation, coordination, and cooperation.

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Chapter 3 Conservation and Management Measures

The Fishery Management Plan (FMP) for Groundfish of the Gulf of Alaska (GOA) Management Area authorizes the commercial harvest of species listed in Section 3.1 of this FMP. Commercial fishing is authorized during the fishing year unless otherwise specified in the FMP. Section 3.2 describes the procedures for determining harvest levels for the groundfish species. Sections 3.3 to 3.6 address permit and participation, authorized gear, time and area, and catch restrictions, respectively. Section 3.7 describes the specific management measures for the quota share program in place in the fixed gear sablefish fishery. Measures that allow flexible management authority are addressed in Section 3.8, and Section 3.9 designates monitoring and reporting requirements for the fisheries. Section 3.10 describes the schedule and procedures for review of the FMP or FMP components.

The groundfish resources off Alaska have been harvested and processed entirely by U.S.-flagged vessels since 1991. Conservation and management measures contained in this FMP apply exclusively to domestic fishing activities. No portion of the annual optimum yield is allocated to foreign harvesters or foreign processors.

3.1 Areas and Stocks Involved

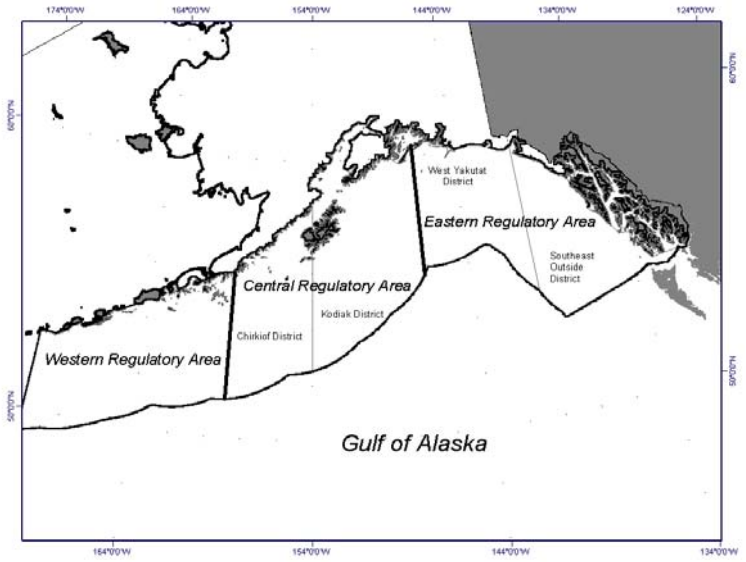
The FMP and its management regime governs fishing in the GOA management area described in Section 3.1.1, for those stocks listed in Section 3.1.2.

3.1.1 Management Area

The Gulf of Alaska management area encompasses the U.S. Exclusive Economic Zone (EEZ) of the North Pacific Ocean, exclusive of the Bering Sea, between the eastern Aleutian Islands at 170° W. longitude and Dixon Entrance at 132°40' W. longitude (Figure 1-1).

The management area is divided into the following regulatory areas: Western, Central, and Eastern. The Central regulatory area is divided into two districts: Chirikof and Kodiak. The Eastern regulatory area is also divided into two districts: West Yakutat and Southeast Outside. The regulatory areas and districts are illustrated in Figure 3-1. Geographical coordinates for these areas are described in Appendix B.

Figure 3-1 Regulatory Areas of the Gulf of Alaska.



3.1.2 Stocks

Stocks governed by the FMP include all finfish, except salmon, steelhead, halibut, herring, and tuna, which are distributed or are exploited in the area described in Section 3.1.1, and which are listed in Table 3-1. Harvest allocations and management are based on the calendar year.

Five categories of species or species groups are likely to be taken in the groundfish fishery. Species may be split or combined within the "target species" category according to procedures set forth in Section 3.2.5 without amendments to this FMP, notwithstanding the designation listed in the FMP. The optimum yield concept is applied to all except the "prohibited species" category. These categories are tabulated in Table 3-1 and are described as follows:

1. Prohibited Species – are those species and species groups the catch of which must be avoided while fishing for groundfish, and which must be immediately returned to sea with a minimum of injury except when their retention is authorized by other applicable law (see also Prohibited Species Donation Program described in Section 3.6.1.1). Groundfish species and species groups under the FMP for which the quotas have been achieved shall be treated in the same manner as prohibited species.

2. Target species – are those species that support a single species or mixed species target fishery, are commercially important, and for which a sufficient data base exists that allows each to be managed on its own biological merits. Accordingly, a specific total allowable catch (TAC) is established annually for each target species. Catch of each species must be recorded and reported. This category includes walleye pollock, Pacific cod, sablefish, shallow and deep water flatfish, rex sole, flathead sole, arrowtooth flounder, Pacific ocean perch, shortraker/rougheye rockfish, northern rockfish, "other slope" rockfish, pelagic shelf rockfish, demersal shelf rockfish, thornyhead rockfish, Atka mackerel, and skates.

3. Other Species – are those species or species groups that currently are of slight economic value and not generally targeted upon. This category, however, contains species with economic potential or which are important ecosystem components, but insufficient data exist to allow separate management. Accordingly, a single TAC applies to this category as a whole. The TAC will be equal to 5 percent

of the combined TACs for target species. Catch of this category as a whole must be recorded and reported. The category includes squid, sculpins, sharks, and octopus.

4. Forage fish species – are those species listed in Table 3-1, which are a critical food source for many marine mammal, seabird and fish species. The forage fish species category is established to allow for the management of these species in a manner that prevents the development of a commercial directed fishery for forage fish. Management measures for this species category will be specified in regulations and may include such measures as prohibitions on directed fishing, limitations on allowable bycatch retention amounts, or limitations on the sale, barter, trade or any other commercial exchange, as well as the processing of forage fish in a commercial processing facility.

5. Nonspecified species – are those species and species groups of no current economic value taken by the groundfish fishery only as an incidental catch in the target fisheries. Virtually no data exist which would allow population assessments. No record of catch is necessary. The allowable catch for this category is the amount that is taken incidentally while fishing for target and other species, whether retained or discarded.

Table 3-1 Species included in the FMP species categories

Prohibited Species[1]	Pacific halibut Pacific herring Pacific salmon Steelhead trout King crab Tanner crab
Target Species[2]	Walleye pollock Pacific cod Sablefish Flatfish (shallow-water flatfish, deep-water flatfish, rex sole, flathead sole, arrowtooth flounder) Rockfish (Pacific ocean perch, northern rockfish, shortraker and rougheye rockfish, other slope rockfish, pelagic shelf rockfish, demersal shelf rockfish[3], thornyhead rockfish) Atka mackerel Skates (big and longnose skates, other skates)
Other Species[4]	Squid Sculpins Sharks Octopus
Forage Fish Species[5]	Osmeridae family (eulachon, capelin, and other smelts) Myctophidae family (lanternfishes) Bathylagidae family (deep-sea smelts) Ammodytidae family (Pacific sand lance) Trichodontidae family (Pacific sand fish) Pholidae family (gunnels) Stichaeidae family (pricklebacks, warbonnets, eelblennys, cockscombs, and shannys) Gonostomatidae family (bristlemouths, lightfishes, and anglemouths) Order Euphausiacea (krill)

[1]Must be immediately returned to the sea
[2]TAC for each listing
[3]Management delegated to the State of Alaska
[4]Aggregate TAC for group
[5]Management measures for forage fish are established in regulations implementing the FMP

3.2 Determining Harvest Levels

This section of the FMP provides the basis for determining harvest levels in the groundfish fisheries. Section 3.2.1 defines terms used in the harvest specification process. The maximum sustainable yield and optimum yield of groundfish in the GOA are addressed in Sections 3.2.2 and 3.2.3. Criteria for determining overfishing are described in Section 3.2.4, followed by the procedures for setting total allowable catch in Section 3.2.5.

Section 3.2.6 specifies those groundfish fisheries for which the total allowable catch is apportioned by gear type, area, or season. Section 3.2.7 identifies the consequences of attaining total allowable catch.

The Council harvest strategy was reviewed in 2002 by Goodman *et al.*.The report contains a historical overview of the Council's approach to fishery harvest management, and an analysis of single-species, multispecies and ecosystem issues relating to the harvest strategy. The report is available by request from the Council office.

3.2.1 Definition of Terms

Maximum sustainable yield (MSY) is the largest long-term average catch or yield that can be taken from a stock or stock complex under prevailing ecological and environmental conditions.

Optimum yield (OY) is the amount of fish which–

a) will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities, and taking into account the protection of marine ecosystems;
b) is prescribed as such on the basis of the MSY from the fishery, as reduced by any relevant economic, social, or ecological factor; and
c) in the case of an overfished fishery, provides for rebuilding to a level consistent with producing the MSY in such fishery.

Overfishing level (OFL) is a limit reference point set annually for a stock or stock complex during the assessment process, as described in Section 3.2.4, Overfishing criteria. Overfishing occurs whenever a stock or stock complex is subjected to a rate or level of fishing mortality that jeopardizes the capacity of a stock or stock complex to produce MSY on a continuing basis. Operationally, overfishing occurs when the harvest exceeds the OFL.

Acceptable biological catch (ABC) is an annual sustainable target harvest (or range of harvests) for a stock or stock complex, determined by the Plan Team and the Science and Statistical Committee during the assessment process. It is derived from the status and dynamics of the stock, environmental conditions, and other ecological factors, given the prevailing technological characteristics of the fishery. The target reference point is set below the limit reference point for overfishing.

Total allowable catch is the annual harvest limit for a stock or stock complex, derived from the ABC by considering social and economic factors.

In addition to definitional differences, OY differs from ABC and TAC in two practical respects. First, ABC and TAC are specified for each stock or stock complex within the "target species" and "other species" categories, whereas OY is specified for the groundfish fishery (comprising target sepcies and other species categories) as a whole. Second, ABCs and TACs are specified annually whereas the OY range is constant. The sum of the stock-specific ABCs may fall within or outside of the OY range. If the sum of annual TACs falls outside the OY range, TACs must be adjusted or the FMP amended.

3.2.2 Maximum Sustainable Yield of the Groundfish Complex

The groundfish complex and its fishery are a distinct management unit of the Gulf of Alaska. This complex forms a large subsystem of the GOA ecosystem with intricate interrelationships between predators and prey, between competitors, and between those species and their environment. Ideally, concepts such as productivity and MSY should be viewed in terms of the groundfish complex as a unit rather than for individual species

or species groups. Due to the difficulty of estimating the parameters that govern interactions between species, however, estimates of MSY for the groundfish complex have sometimes been computed by summing MSY estimates for the individual species and species groups.

Early studies estimated MSY for the GOA groundfish complex ranging from 804,950 mt in 1983 to 1,018,750 mt for the 1987 fishing year. This range was obtained by summing the MSY ranges for each target species excluding the "other species" category. However, current multi-species models suggest that the sum of single-species MSYs provides a poor estimate of MSY for the groundfish complex as a whole (Walters *et al.*, in press) because biological reference points for single stocks, such as F_{MSY}, may change substantially when multi-species interactions are taken into account (Gislason 1999; Collie and Gislason 2001). Fishing mortality rates for prey species that are consumed by other marine predators should be conditioned on the level of predation mortality, which may change over time depending on predator population levels.

An ecosystem perspective suggests that the MSY of the groundfish complex may change if an environmental regime shift occurs or if the present mix of species is altered substantially. Also, as new data are acquired and as statistical methodology evolves over time, it is to be expected that estimates of MSY will change, even if the ecosystem has remained relatively stationary. Therefore, estimates of MSY contained in this section should be viewed in context, as historical estimates that guided development of the FMP.

3.2.3 Optimum Yield of the Groundfish Complex

The range of optimum yield specified in the FMP is 116,000-800,000 mt of groundfish for the target species and the "other species" categories, to the extent this can be harvested consistently with the management measures specified in this FMP. This range was established in 1987 based on the examination of historical and recent catches, recent determinations of ABC, and recent and past estimates of MSY for each major groundfish species. This derivation from historical estimates of MSY and fishery performance reflects the combined influence of biological, ecological, and socioeconomic factors. The end points of the range were derived as described below.

For the minimum value, 116,000 mt was approximately equal to the lowest historical groundfish catch during the 21-year period 1965-1985 (116,053 mt in 1971, NPFMC 1986). In that year catches of pollock, Pacific cod and Atka mackerel were all at very low levels. Given the status of the groundfish resources and the present management regime, it was considered extremely unlikely that future total harvest would fall below this level. Thus, the TACs must be established so as to result in a sum of at least 116,000 mt.

The upper end of the OY range, 800,000 mt, was derived from MSY information. The MSY for all species of groundfish (excluding the other species category) between 1983 and 1987 ranged from 804,950 mt in 1983 to 1,137,750 mt for the 1987 fishing year. The average MSY over the five-year period was 873,070 mt. Therefore, the upper end of the range is approximately equal to 92 percent of the mean MSY for the five-year period. The ABC summed for all species ranged from 457,082 mt in 1985 to 814,752 mt in 1987. Most of the variation in the ABC and catch over the five-year interval resulted from changes in the status of two species: pollock and flounder. Pollock ABC ranged from 112,000 mt in 1987 to 516,600 mt in 1984; while flounder ABC ranged from 33,500 mt in 1985 to 537,000 mt in 1987. Therefore, the 800,000 mt upper end of the OY range was selected in consideration of the volatility in pollock and flounder ABC, and the potential for harvesting at MSY.

The OY range is not likely to have any significant detrimental impact on the industry. On the contrary, specification of OY as a constant range helps to create a stable management environment in which the industry can plan its activities consistently, with an expectation that each year's total groundfish catch will

be at least 116,000 mt. The OY range encompasses the annual catch levels taken in the period immediately prior to its implementation, during which the fishery operated profitably.

OY may need to be respecified in the future if major changes occur in the estimate of MSY for the groundfish complex. Likewise, OY may need to be respecified if major changes occur in the ecological, social, or economic factors governing the relationship between OY and MSY.

3.2.4 Overfishing Criteria

Overfishing is defined as any amount of fishing in excess of a prescribed maximum allowable rate. This maximum allowable rate is prescribed through a set of six tiers which are listed below in descending order of preference, corresponding to descending order of information availability. The Council's Science and Statistical Committee (SSC) will have final authority for determining whether a given item of information is "reliable" for the purpose of this definition, and may use either objective or subjective criteria in making such determinations.

For tier (1), a "pdf" refers to a probability density function. For tiers 1 and 2, if a reliable pdf of B_{MSY} is available, the preferred point estimate of B_{MSY} is the geometric mean of its pdf. For tiers 1 to 5, if a reliable pdf of B is available, the preferred point estimate is the geometric mean of its pdf. For tiers 1 to 3, the coefficient **"** is set at a default value of 0.05. This default value was established by applying the 10 percent rule suggested by Rosenberg et al. (1994) to the ½ B_{MSY} reference point. However, the SSC may establish a different value for a specific stock or stock complex as merited by the best available scientific information. For tiers 2 to 4, a designation of the form "$F_{X\%}$" refers to the F associated with an equilibrium level of spawning per recruit equal to $X\%$ of the equilibrium level of spawning per recruit in the absence of any fishing. If reliable information sufficient to characterize the entire maturity schedule of a species is not available, the SSC may choose to view spawning per recruit calculations based on a knife-edge maturity assumption as reliable. For tier 3, the term $B_{40\%}$ refers to the long-term average biomass that would be expected under average recruitment and $F=F_{40\%}$.

Tier 1 Information available: Reliable point estimates of B and B_{MSY} and reliable pdf of F_{MSY}.

1a) Stock status: $B/B_{MSY} > 1$
$F_{OFL} = m_A$, the arithmetic mean of the pdf
$F_{ABC} \le m_H$, the harmonic mean of the pdf

1b) Stock status: $a < B/B_{MSY} \le 1$
$F_{OFL} = m_A \times (B/B_{MSY} - a)/(1 - a)$
$F_{ABC} \le m_H \times (B/B_{MSY} - a)/(1 - a)$

1c) Stock status: $B/B_{MSY} \le a$
$F_{OFL} = 0$
$F_{ABC} = 0$

Tier 2 Information available: Reliable point estimates of B, B_{MSY}, F_{MSY}, $F_{35\%}$, and $F_{40\%}$.

2a) Stock status: $B/B_{MSY} > 1$
$F_{OFL} = F_{MSY}$
$F_{ABC} \le F_{MSY} \times (F_{40\%}/F_{35\%})$

2b) Stock status: $a < B/B_{MSY} \le 1$
$F_{OFL} = F_{MSY} \times (B/B_{MSY} - a)/(1 - a)$
$F_{ABC} \le F_{MSY} \times (F_{40\%}/F_{35\%}) \times (B/B_{MSY} - a)/(1 - a)$

2c) Stock status: $B/B_{MSY} \le a$
$F_{OFL} = 0$
$F_{ABC} = 0$

Tier 3 Information available: Reliable point estimates of B, $B_{40\%}$, $F_{35\%}$, and $F_{40\%}$.

3a) Stock status: $B/B_{40\%} > 1$

$F_{OFL} = F_{35\%}$

$F_{ABC} \leq F_{40\%}$

3b) Stock status: $a < B/B_{40\%} \leq 1$

$F_{OFL} = F_{35\%} \times (B/B_{40\%} - a)/(1 - a)$

$F_{ABC} \leq F_{40\%} \times (B/B_{40\%} - a)/(1 - a)$

3c) Stock status: $B/B_{40\%} \leq a$

$F_{OFL} = 0$

$F_{ABC} = 0$

Tier 4 Information available: Reliable point estimates of B, $F_{35\%}$, and $F_{40\%}$.

$F_{OFL} = F_{35\%}$

$F_{ABC} \leq F_{40\%}$

Tier 5 Information available: Reliable point estimates of B and natural mortality rate M.

$F_{OFL} = M$

$F_{ABC} \leq 0.75 \times M$

Tier 6 Information available: Reliable catch history from 1978 through 1995.

OFL = the average catch from 1978 through 1995, unless an alternative value is established by the SSC on the basis of the best available scientific information

ABC $\leq 0.75 \times$ OFL

3.2.5 Procedures for Setting Total Allowable Catch

The Secretary of Commerce (Secretary), after receiving recommendations from the Council, will determine up to 2 years of TACs and apportionments thereof, and reserves for each stock or stock complex in the "target species" and "other species" categories, by January 1 of the new fishing year, or as soon as practicable thereafter, by means of regulations implementing the FMP. Notwithstanding designated stocks or stock complexes listed by category in Table 3-1, the Council may recommend splitting or combining stocks or stock complexes in the "target species" category for purposes of establishing a new TAC if such action is desirable based on commercial importance of a stock or stock complex and whether sufficient biological information is available to manage a stock or stock complex on its own merits.

Prior to making final recommendations to the Secretary, the Council will make available to the public for comment as soon as practicable after its October meeting, proposed specifications of ABC and TAC for each target stock or stock complex and the "other species" category, and apportionments thereof, and reserves.

The Council will provide proposed recommendations for harvest specifications to the Secretary after its October meeting, including detailed information on the development of each proposed specification and any future information that is expected to affect the final specifications. As soon as practicable after the October meeting, the Secretary will publish in the *Federal Register* proposed harvest specifications based on the Council's October recommendations and make available for public review and comment, all information regarding the development of the specifications, identifying specifications that are likely to change, and possible reasons for changes, if known, from the proposed to final specifications. The prior public review and comment period on the published proposed specifications will be a minimum of 15 days.

At its December meeting, the Council will review the final SAFE reports, recommendations from the Groundfish Plan teams, SSC, the Council's Advisory Panel (AP), and comments received. The Council will then make final harvest specifications recommendations to the Secretary for review, approval, and

publication. New final annual specifications will supercede current annual specifications on the effective date of the new annual specifications.

3.2.5.1 Framework for Setting Total Allowable Catch

A procedure has been developed whereby the Council may set annual harvest levels by specifying a total allowable catch for each groundfish fishery on an annual basis. The procedure is used to determine TACs for every groundfish stock and stock complex managed by the FMP with the exception of the stocks listed in the "other species" management category. The "other species" category will be managed by a single TAC equal to 5 percent of the combined TACs for all stocks in the "target species" category. The percentage, determined in 1987, is intended to amply provide for the anticipated incidental catch of these species.

The procedure for setting TAC consists of the following steps:

1. Determine the ABC for each managed stock or stock complex. ABCs are recommended by the Council's SSC based on information presented by the Plan Team.
2. Determine a TAC based on biological and socioeconomic information. The TAC must be less than or equal to the ABC. The TAC may be lower than the ABC if bycatch considerations or socioeconomic considerations cause the Council to establish a lower harvest.
3. Sum TACs for "target species" and "other species" to assure that the sum is within the optimum yield range specified for the groundfish complex in the FMP. If the sum falls outside this range the TACs must be adjusted or the FMP amended.

3.2.5.2 Stock Assessment and Fishery Evaluation

For purposes of supplying scientific information to the Council for use in specifying TACs, a *Stock Assessment and Fishery Evaluation* report is prepared annually (or biennially for some species).

Scientists from the Alaska Fisheries Science Center, the Alaska Department of Fish and Game, and other agencies and universities prepare *Stock Assessment and Fishery Evaluation* (SAFE) documents annually (see Section 3.2.5.2 for further information). These documents are first reviewed by the Groundfish Plan Team, and then by the Council's SSC and AP, and the Council. Reference point recommendations are made at each level of assessment. Usually, scientists recommend values for ABC and OFL, and the AP recommends values for TAC. The Council has final authority to approve all reference points, but focuses on setting TACs so that OY is achieved and OFLs are not exceeded.

The SAFE report will, at a minimum, contain or refer to the following:

1. current status of GOA management area groundfish resources, by major species or species group;
2. estimates of maximum sustainable yield and acceptable biological catch;
3. estimates of groundfish species mortality from non-groundfish fisheries, subsistence fisheries, and recreational fisheries, and difference between groundfish mortality and catch, if possible;
4. fishery statistics (landings and value) for the current year;
5. the projected responses of stocks and fisheries to alternative levels of fishing mortality;
6. any relevant information relating to changes in groundfish markets;
7. information to be used by the Council in establishing prohibited species catch limits for prohibited species with supporting justification and rationale (further detail in Section 3.6.2); and

8. any other biological, social, or economic information that may be useful to the Council.

The Council will use the following to develop its own preliminary recommendations: 1) recommendations of the Plan Team and Council's SSC and information presented by the Plan Team and SSC in support of these recommendations; 2) information presented by the Council's Advisory Panel and the public; and 3) other relevant information.

3.2.5.3 Reserves

Reserves are set at 20 percent of the TAC of pollock, Pacific cod, flatfish, and "other species". At any time, the Regional Administrator may assess these fisheries and apportion to them any amounts from the reserves that is determined will be harvested.

Any additional in-season allocation from reserves may carry with it an additional prohibited species catch (PSC) limit amount proportional to that reserve release and the respective bycatch rates in the affected fisheries.

3.2.6 Apportionment of Total Allowable Catch

3.2.6.1 Seasonal Allocations

Harvest allocations and management are based on the calendar year.

3.2.6.1.1 Pollock

The annual TAC established for pollock in the combined Western and Central regulatory areas shall be divided into seasonal allowances. Seasonal allowances of the pollock TAC will be established by regulation. The Council will consider the criteria described in Section 3.5.1 when recommending changes in seasonal allowances. Shortfalls or overages in one seasonal allowance shall be proportionately added to, or subtracted from, subsequent seasonal allowances.

3.2.6.2 Allocations by Geographical Area

TACs are apportioned by regulatory area, and may be further apportioned by district for certain stocks. Some of these districts may be managed together to improve management of these fisheries.

3.2.6.2.1 Pollock

For purposes of managing pollock, the Western and Central regulatory areas are combined to allow improved management and better conservation of the pollock resource.

3.2.6.2.2 Sablefish and Rockfish

The Eastern regulatory area is divided into two districts, West Yakutat and Southeast Outside, for purposes of managing sablefish and rockfish stocks. This division is intended to protect localized sablefish stocks and demersal shelf rockfish stocks and is necessary to prevent overexploitation in the Eastern regulatory area. The Southeast Outside district delineates the primary rockfish fishing ground in this region.

3.2.6.3 Allocations by Gear Type and Sector

3.2.6.3.1 Sablefish

In the Eastern regulatory area, from 1986 forward, vessels using hook-and-line gear shall be permitted to take up to 95 percent of the TAC for sablefish. Vessels using trawl gear shall be permitted to harvest up to 5 percent of the TAC for sablefish.

In the Central and Western regulatory areas, from 1987 and 1989 forward (respectively), vessels using hook-and-line gear shall be permitted to take up to 80 percent of the sablefish TAC, and vessels using trawl gear shall be permitted to take up to 20 percent of the TAC.

3.2.6.3.2 Pacific Cod and Pollock

The GOA pollock and Pacific cod TACs will be allocated between the inshore and offshore components of industry in specific shares in order to lessen or resolve resource use conflicts and preemption of one segment of the groundfish industry by another, to promote stability between and within industry sectors and affected communities, and to enhance conservation and management of groundfish and other fish resources.

Definitions

Inshore is defined to consist of three components of the industry:

1. All shoreside processors as defined in federal regulations.
2. All catcher/processors less than 125 ft LOA that have declared themselves to be “inshore”.
3. All motherships or floating processors that have declared themselves to be “inshore”.

Offshore is defined as all processors not included in the definition of inshore component.

Inshore endorsements and operating restrictions

Annually before operations commence, each mothership, floating processing vessel and catcher/processor vessel that intends to process GOA pollock or GOA Pacific cod harvested in an inshore directed fishery for those species must apply for and receive an inshore processing endorsement on its Federal fisheries or Federal processor permit. All shoreside processors are by definition included in the inshore component and are not required to apply for an inshore processing endorsement. Once an inshore processing endorsement is issued it is valid for the duration of the fishing year and cannot be rescinded. Processors that lack an inshore processing endorsement are prohibited from processing GOA pollock or GOA Pacific cod harvested in a directed fishery for processing by the inshore component. Harvesting vessels that do not process pollock or Pacific cod do not need an inshore processing endorsement and may choose to deliver their catch to either or both components.

Catcher/processors that hold an inshore processing endorsement are prohibited from harvesting or processing more than 126 mt (round weight) of pollock or GOA Pacific cod in combination during any fishing week.

Motherships and floating processors that hold an inshore processing endorsement must process all GOA pollock and GOA Pacific cod harvested in a directed fishery for those species in a single geographic location inside the waters of the State of Alaska during a fishing year.

Motherships and floating processors that hold an inshore processing endorsement are prohibited from:

1. operating as catcher/processors in the BSAI during the same fishing year.
2. operating as American Fisheries Act motherships in the BSAI directed pollock fishery during the same fishing year.

Allocations

One hundred percent of the allowed harvest of pollock is allocated to inshore catcher/processors or to harvesting vessels which deliver their catch to the inshore component, with the exception that offshore catcher/processors, and vessels delivering to the offshore component, will be able to take pollock incidentally as bycatch in other directed fisheries. All pollock caught as bycatch in other fisheries will be attributed to the sector which processes the remainder of the catch.

Ninety percent of the allowed harvest of Pacific cod is allocated to inshore catcher/processors or to harvesting vessels which deliver to the inshore component and to inshore catcher/processors; the remaining ten percent is allocated to offshore catcher/processors and harvesting vessels which deliver to the offshore component. All Pacific cod caught as bycatch in other fisheries will be attributed to the sector which processes the remainder of the catch.

These allocations shall be made by subarea and period as provided in federal regulations implementing this FMP.

Reapportionment of unused allocations

If during the course of the fishing year it becomes apparent that a component will not process the entire amount of the allocation, the amount which will not be processed shall be released to the other components for that year. This shall have no impact upon the allocation formula.

3.2.7 Attainment of Total Allowable Catch

The attainment of a TAC for a species will result in the closure of the target fishery for that species. That is, once the TAC is taken, further retention of that species will be prohibited. Other fisheries targeting on other species could be allowed to continue as long as the non-retainable bycatch of the closed species is found to be non-detrimental to that stock.

3.3 Permit and Participation Restrictions

Certain permits are required of participants in the GOA groundfish fisheries. The framework of the License Limitation Program (Section 3.3.1) and the exempted fishing permit program (Section 3.3.2) is set out below, however specific requirements are found in regulations implementing the FMP. Additionally restrictions on participation by vessels participating in other rationalization programs are detailed in Section 3.3.3.

3.3.1 License Limitation Program

Beginning on January 1, 2002, a Federal groundfish license is required for harvesting vessels (including harvester/processors) participating in all directed GOA groundfish fisheries, other than fixed gear sablefish throughout the GOA and demersal shelf rockfish in the Southeast Outside area (east of 140° W. longitude). Vessels fishing in State of Alaska waters (0-3 miles offshore) will be exempt, as will vessels less than 26 ft

LOA. Vessels exempted from the GOA groundfish license program, will be limited to the use of legal fixed gear in the Southeast Outside area.

3.3.1.1 Elements of the License Limitation Program

1. Nature of Licenses. General licenses will be issued for the entire GOA area based on historical landings. Vessels that qualify for both a BSAI and GOA general licenses will be issued both as a non-severable package. Area endorsements will be issued along with the general license for the Southeast Outside, Central GOA including West Yakutat, and/or Western GOA areas. General licenses and endorsements will remain a non-severable package.

2. License Recipients. Licenses will be issued to owners (as of June 17, 1995) of qualified vessels. The owners as of this date must be "persons eligible to document a fishing vessel" under Chapter 121, Title 46, U.S.C. In cases where the vessel was sold on or before June 17, 1995, and the disposition of the vessel's fishing history for license qualification was not mentioned in the contract, the license qualification history would go with the vessel. If the transfer occurred after June 17, 1995, the license qualification history would stay with the seller of the vessel unless the contract specified otherwise.

3. License Designations. Licenses and endorsements will be designated as Catcher Vessel or Catcher Processor and with one of three vessel length classes (less than 60 ft, greater than or equal to 60 ft but less than 125 ft, or greater than or equal to 125 ft LOA). Vessels less than 60 ft LOA with a catcher vessel designation may process up to 1 mt (round weight) of fish per day. Southeast Outside endorsements will be designated for use by legal fixed gear only.

   General licenses will also contain a gear designation (trawl gear, non-trawl gear, or both) based on landings activity in any area through June 17, 1995. Vessels that used both trawl and non-trawl gear during the original qualification period would receive both gear designations, while vessels that used only trawl gear or only non-trawl gear during the original qualification period (general or endorsement period) would receive one or the other. For vessels that used only one gear type (trawl/non-trawl) in the original qualification period, and then used the other gear type between June 18, 1995 and February 7, 1998, the license recipient may choose one or the other gear designation, but will not receive both. For vessels that used only one gear type (trawl/non-trawl) in the original qualification period, but made a significant financial investment towards conversion to the other gear type or deployment of such gear on or before February 7, 1998, and made landings on that vessel with the new gear type by December 31, 1998, the license recipient may choose which gear designation to receive, but not both. A significant financial commitment is defined as a minimum purchase of $100,000 worth of equipment specific to trawling or having acquired groundline, hooks or pots, and hauling equipment for the purpose of prosecuting the non-trawl fisheries on or by February 7, 1998.

4. Who May Purchase Licenses. Licenses may be transferred only to "persons" defined as those "eligible to document a fishing vessel" under Chapter 121, Title 46, U.S.C. Licenses may not be leased.

5. Vessel/License Linkages. Licenses may be transferred without a vessel, i.e., licenses may be applied to vessels other than the one to which the license was initially issued. However, the new vessel is still subject to the license designations, vessel upgrade provisions, "20 percent upgrade rule" (defined in provision seven), and the no leasing provision. Licenses may be applied to vessels shorter than the maximum LOA allowed by the license regardless of the vessel's length designation. Vessels may also use catcher processor licenses on catcher vessels. However, the reverse is not allowed.

   Notwithstanding the above, licenses earned on vessels that did not hold a Federal fisheries permit prior to October 9, 1998, may be transferred only if the vessel originally assigned the license is

transferred along with the license, unless a fishing history transfer occurred prior to February 7, 1998, in which case the vessel does not have to accompany the license earned from that fishing history; however, any future transfer of that license would have to include that vessel.

6. Separability of General Licenses and Endorsements. General licenses may be issued for the BSAI groundfish, GOA groundfish, and BSAI crab fisheries. Those general licenses initially issued to a person based on a particular vessel's catch history are not separable and shall remain as a single "package". General licenses transferred after initial allocation shall remain separate "packages" in the form they were initially issued, and will not be combined with other general groundfish or crab licenses the person may own. Area endorsements are not separable from the general license they are initially issued under, and shall remain as a single "package", which includes the assigned catcher vessel/catcher processor and length designations.

7. Vessel Replacements and Upgrades. Vessels may be replaced or upgraded within the bounds of the vessel length designations and the "20 percent rule". This rule was originally defined for the vessel moratorium program. The maximum LOA with respect to a vessel means the greatest LOA of that vessel or its replacement that may qualify it to conduct directed fishing for groundfish covered under the license program, except as provided at § 676.4(d). The maximum LOA of a vessel with license qualification will be determined by the Regional Administrator as follows:

   a. For a vessel with license qualification that is less than 125 ft LOA, the maximum LOA will be equal to 1.2 times the vessel's original qualifying length or 125 ft, whichever is less; and

   b. For a vessel with license qualification that is equal to or greater that 125 ft, the maximum LOA will be equal to the vessel's original qualifying length.

   If a vessel upgrades under the "20 percent rule" to a length which falls into a larger license length designation after June 17, 1995, then the vessel owner would be initially allocated a license and endorsement(s) based on the vessels June 17, 1995 length. Those licenses and endorsements could not be used on the qualifying vessel, and the owner would be required to obtain a license for that vessel's designation before it could be fished.

8. License Ownership Caps. No more than 10 general groundfish licenses may be purchased or controlled by a "person", with grandfather rights to those persons who exceed this limit in the initial allocation. Persons with grandfather rights from the initial allocation must be under the 10 general license cap before they will be allowed to purchase any additional licenses. A "person" is defined as those eligible to document a fishing vessel under Chapter 121, Title 46, U.S.C. For corporations, the cap would apply to the corporation and not to share holders within the corporation.

9. Vessel License Use Caps. There is no limit on the number of licenses (or endorsements) that may be used on a vessel.

10. Changing Vessel Designations. If a vessel qualifies as a catcher processor, it may select a one time (permanent) conversion to a catcher vessel designation.

11. Implement a Skipper Reporting System. NMFS will implement a skipper reporting system that requires groundfish license holders to report skipper names, addresses, and service records.

12. Vessels Targeting Non-groundfish Species. Vessels targeting non-groundfish species that are allowed to land incidentally taken groundfish species without a Federal permit before implementation of the groundfish license program, will be allowed to continue to land bycatch amounts of groundfish without having a valid groundfish license. Additionally, vessels targeting sablefish and halibut under the individual fishing quota (IFQ) program will continue to be allowed to retain bycatch amounts of groundfish species.

13. Community Development Quota Vessel Exemption. Vessels less than 125 ft LOA obtained under an approved community development quota (CDQ) plan to participate in both CDQ and non-CDQ fisheries will be allowed to continue to fish in the GOA groundfish fisheries without a license, provided such vessel was under construction or operating in an existing community development plan as of October 9, 1998. If the vessel is sold outside the CDQ plan, the vessel will no longer be exempt from the rules of the license program.

14. Lost Vessels. Vessels that qualified for the moratorium and were lost, damaged, or otherwise out of the fishery due to factors beyond the control of the owner and which were replaced or otherwise reentered the fishery in accordance with the moratorium rules, and which made a landing any time between the time the vessel left the fishery and June 17, 1995, will be qualified for a general license and endorsement for that area.

15. Licenses Represent a Use Privilege. The Council may alter or rescind this program without compensation to license holders; further, licenses may be suspended or revoked for (serious and/or multiple) violations of fisheries regulations.

3.3.2 Exempted Fishing Permits

The Regional Administrator, after consulting with the Director of the Alaska Fisheries Science Center and with the Council, may authorize for limited experimental purposes, the target or incidental harvest of groundfish that would otherwise be prohibited. Exempted fishing permits might be issued for fishing in areas closed to directed fishing, for continued fishing with gear otherwise prohibited, or for continued fishing for species for which the quota has been reached. Exempted fishing permits will be issued by means of procedures contained in regulations.

As well as other information required by regulations, each application for an exempted fishing permit must provide the following information: 1) experimental design (e.g., staffing and sampling procedures, the data and samples to be collected, and analysis of the data and samples), 2) provision for public release of all obtained information, and 3) submission of interim and final reports.

The Regional Administrator may deny an exempted fishing permit for reasons contained in regulations, including a finding that:

a. according to the best scientific information available, the harvest to be conducted under the permit would detrimentally affect living marine resources, including marine mammals and birds, and their habitat in a significant way;

b. issuance of the exempted fishing permit would inequitably allocate fishing privileges among domestic fishermen or would have economic allocation as its sole purpose;

c. activities to be conducted under the exempted fishing permit would be inconsistent with the intent of the management objectives of the FMP;

d. the applicant has failed to demonstrate a valid justification for the permit;

e. the activity proposed under the exempted fishing permit could create a significant enforcement problem; or

f. the applicant failed to make available to the public information that had been obtained under a previously issued exempted fishing permit.

3.3.3 Access Limitation

The Council may wish to limit access in the fisheries in the GOA in order to maintain an orderly fishery and prevent overcapitalization in the harvesting sector. An objective for fisheries management as stated in the Magnuson-Stevens Act is to maximize the benefit to the nation derived from fisheries. This implies efficient use of our nation's resources, including labor and capital.

When an industry that harvests a common-property resource becomes overcapitalized, as is often the case in the commercial fisheries, society's resources are not used in their most efficient manner. This will make it difficult to maximize the fishery's benefit to the nation. Other factors besides efficiency are considered by the Council and may make access limitation less attractive in certain situations; however, limiting access in a fishery is an important management tool and the option to use it should be made available to managers.

Access limitation may take the form of a limit on the number of licenses issued for a fishery, individual shares of the annual quota, taxes on catch, or high license or landing fees. Taxes and fees may be used in conjunction with license limitation or individual quotas. Should the Council wish to implement an access limitation program, the FMP will require amendment providing the supporting rationale and specific details of the measure.

3.3.4 Sideboards

3.3.4.1 American Fisheries Act

On October 21, 1998, the President signed into law the American Fisheries Act (AFA) which mandated sweeping changes to the conservation and management program for the pollock fishery of the Bering Sea and Aleutian Islands and to a lesser extent, affected the management programs for the other groundfish fisheries of the BSAI, the groundfish fisheries of the GOA, the king and Tanner crab fisheries of the BSAI, and the scallop fishery off Alaska.

While the AFA primarily affects the management of the BSAI pollock fishery, the Council is also directed to develop and recommend harvesting and processing sideboard restrictions for AFA catcher vessels, AFA catcher/processors, AFA motherships, and AFA inshore processors that are fishing for or processing groundfish harvested in the GOA. Section 211 of the AFA addresses harvesting and processing sideboards for the GOA and this entire section of the AFA is incorporated into the FMP by reference (see Appendix C). GOA harvesting and processing sideboard restrictions that are consistent with section 211 of the AFA will be implemented through regulation. Any measure recommended by the Council that supersedes section 211 of the AFA must be implemented by FMP amendment in accordance with the provisions of section 213 of the AFA and the Magnuson-Stevens Act.

3.4 Gear Restrictions

3.4.1 Authorized Gear

Gear types authorized by the FMP are trawls, hook-and-line, pots, jigs, and other gear as defined in regulations. Further restrictions on gear that are necessary for conservation and management of fishery resources and which are consistent with the goals and objectives of the FMP are found at 50 CFR part 679. Additional gear limitations by specific target fishery are described in Section 3.4.2.

3.4.2 Target Fishery Specific

Sablefish

Legal gear for the taking of sablefish in any regulatory area of the GOA are trawls and hook-and-lines.

3.5 Time and Area Restrictions

Management measures in place in the GOA groundfish fisheries constrain fishing both temporally and spatially. In Section 3.5.1, the fishing year is defined and criteria for determining fishing seasons are described. Area restrictions by gear type are described in Section 3.5.2. The FMP also authorizes the use of either temporal or spatial restrictions for marine mammal conservation, as detailed in Section 3.5.3. Section 3.5.4 addresses gear testing exemptions to the time and area restrictions in the FMP or its implementing regulations.

3.5.1 Fishing Seasons

The fishing year is defined as January 1 through December 31.

Fishing seasons are defined as periods when harvesting groundfish is permitted. Fishing seasons will normally be within a calendar year, if possible, for statistical purposes, but could span two calendar years if necessary. Changes to fishing seasons can be recommended by the Council at any time. In consultation with the Council, the Secretary will establish all fishing seasons by regulations that implement the FMP, to accomplish the goals and objectives of the FMP, the Magnuson-Stevens Act, and other applicable law. Season openings will remain in effect unless amended by regulations implementing the FMP.

The Council will consider the following criteria when recommending regulatory amendments:

- biological: spawning periods, migration, and other biological factors;
- bycatch: biological and allocative effects of season changes;
- exvessel and wholesale prices: effects of season changes on prices;
- product quality: producing the highest quality product to the consumer;
- safety: potential adverse effects on people, vessels, fishing time, and equipment;
- cost: effects on operating costs incurred by the industry as a result of season changes;
- other fisheries: possible demands on the same harvesting, processing, and transportation systems needed in the groundfish fishery;
- coordinated season timing: the need to spread out fishing effort over the year, minimize gear conflicts, and allow participation by all elements of the groundfish fleet;
- enforcement and management costs: potential benefits of seasons changes relative to agency resources available to enforce and manage new seasons; and
- allocation: potential allocation effects among users and indirect effects on coastal communities.

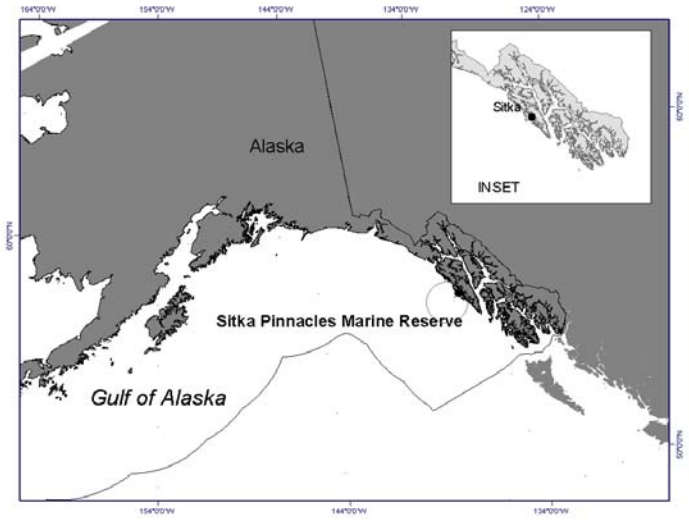
3.5.2 Area Restrictions

3.5.2.1 All Vessels

3.5.2.1.1 Sitka Pinnacles Marine Reserve

The Sitka Pinnacles Marine Reserve encompasses an area totaling 2.5 square nautical miles off Cape Edgecumbe. Vessels holding a Federal fisheries permit are prohibited at all times from fishing for groundfish or anchoring in the Sitka Pinnacles Marine Reserves. The area is illustrated in Figure 3-2 and its coordinates are described in Appendix B.

Figure 3-2 Sitka Pinnacles Marine Reserve.



3.5.2.2 Trawl Gear Only

3.5.2.2.1 King Crab Closure Areas around Kodiak Island

A time/area closure scheme has been developed to help protect and rebuild the Kodiak king crab resource. The number of red king crab in the waters around Kodiak Island is at a historically low level. Most of these crab are old and sexually mature. There has been no sign of significant recruitment since 1979. As a result, the Kodiak king crab fishery has been closed since 1983 in an attempt to rebuild the stocks. While the cause for the decline of king crab is not known, most researchers believe that the decline can be attributed to a variety of environmental factors which independently or in combination led to the depressed condition of the resource. The extent to which the king crab decline is due to commercial fishing, either directed or incidental, is unknown.

King crab are known to concentrate in certain areas around Kodiak Island during the year. In the spring they migrate inshore to molt and mate. Approximately 70 percent of the female red king crab stocks are estimated to congregate in two areas, known as the Alitak/Towers and Marmot Flats. The Chirikof Island and Barnabas areas also possess concentrations of king crab but in lesser amounts. Past studies have shown that most king crab around Kodiak molt and mate in the March-May period, although some molting crab can be found during late-January through mid-June. Adult female king crabs must molt to mate and extrude eggs. After

molting, their exoskeleton (shell) is soft, and crabs in this stage are known as soft-shell crabs. The new exoskeletons take two to three months to harden fully. During the soft-shell period, the crabs are particularly susceptible to injury and mortality from handling and from encounters with fishing gear. Because many of the present and potential groundfish trawling grounds overlap with the mating grounds of king crab, the potential exists for substantial king crab mortality.

While it is generally assumed that mortality of soft-shelled king crab can be high with any gear type, incidental mortality of hard-shell crab as a result of encounters with fishing gear is not known. Bottom trawl fishing could kill or injure king crab in two ways. First, crabs caught in the net can be crushed during the tow or injured as the catch is unloaded in the fishing vessel. Second, crabs might be struck with parts of the gear (e.g., trawl doors, towing cables, groundlines, roller gear) as the trawl is towed along the bottom.

Areas around Kodiak Island have been established to protect king crab stocks. These areas are designated as Type I, II, or III areas, according to the definitions listed in Table 3-2. For purposes of implementing a Type III area, a "recruitment event" is defined as the appearance of female crab in substantially increased numbers. A substantially increased number is defined as occurring when the total number of females estimated for a given district equals the number of females established as a threshold criteria for opening that district to commercial crab fishing. In any given year, a recruitment event may occur in one or more of the Kodiak management districts as indicated by the standardized Kodiak crab survey conducted by the Alaska Department of Fish and Game. A Type III area recruitment event closure will continue until either 1) a commercial crab fishery opens for that district, or 2) the number of crab drops below the threshold level established for that district. Implementation of the Type III area closures would be accomplished by regulatory amendment.

The areas are illustrated in Figure 3-3 and coordinates are described in Appendix B.

Table 3-2 Names and definitions of Type I, II, and III king crab closure areas around Kodiak Island

Area Type	Name	Definition
I	• Alitak Flats and Towers Areas • Marmot Flats Area	Type I areas are those king crab stock rebuilding areas where a high level of protection will be provided to the king crab by closing the area year-round to bottom trawling. Fishing with other gear would be allowed.
II	• Chirikof Island Area • Barnabas Area	Type II areas are those areas that are sensitive for king crab populations and in which bottom trawling will be prohibited during the soft-shell season (February 15 - June 15). Fishing with other gear would be allowed and fishing with bottom trawl gear would be allowed from January 1 - February 14 and June 16 - December 31.
III	• Outer Marmot Bay • Barnabas • Horse's Head • Chirikof	Type III areas are those geographic areas adjacent to a Type I or Type II areas that have been identified as important juvenile king crab rearing or migratory areas. These areas only become operational following a determination that the "recruitment event criteria" have occurred. The NMFS Regional Administrator will classify the expanded area as either Type I or II depending on the information available.

3.5.2.2.2 Cook Inlet non-Pelagic Trawl Closure Area

The use of non-pelagic trawl gear is prohibited in Cook Inlet north of a line extending between Cape Douglas and Point Adam. This prohibition is intended to reduce crab bycatch and assist in the rebuilding of crab stocks. The area is illustrated in Figure 3-4 and its coordinates are described in Appendix B.

3.5.2.2.3 Southeast Outside Trawl Closure

Use of any gear other than non-trawl gear is prohibited at all times in the Southeast Outside district. The area is illustrated in Figure 3-5 and its coordinates are described in Appendix B.

Figure 3-3 King Crab Closure Areas around Kodiak Island.

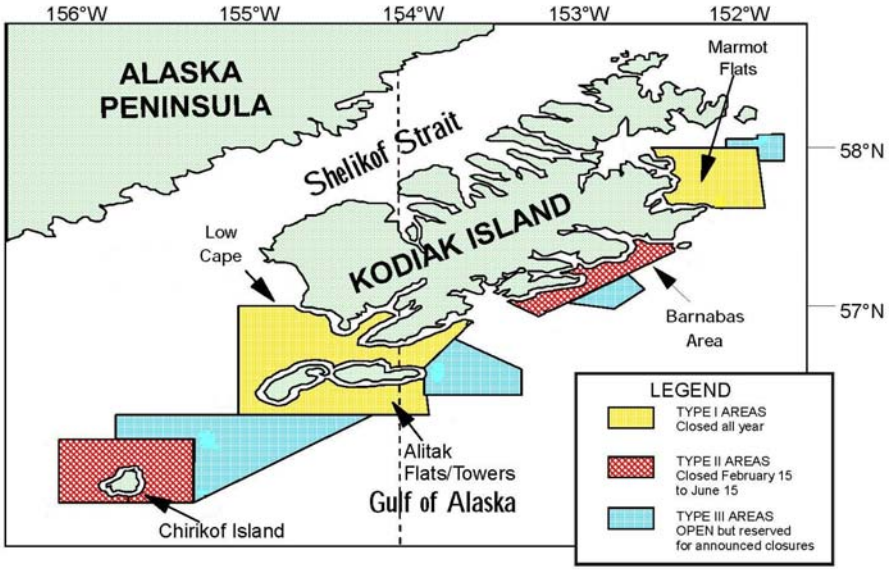


Figure 3-4 Cook Inlet non-pelagic trawl closure area.

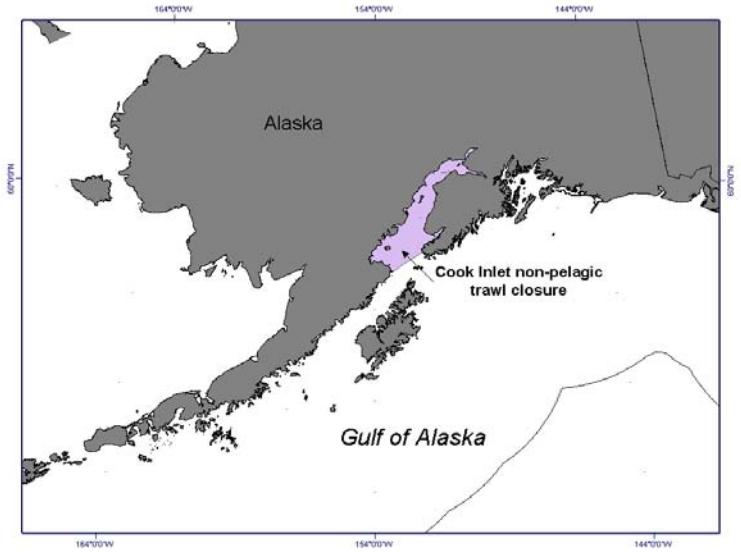
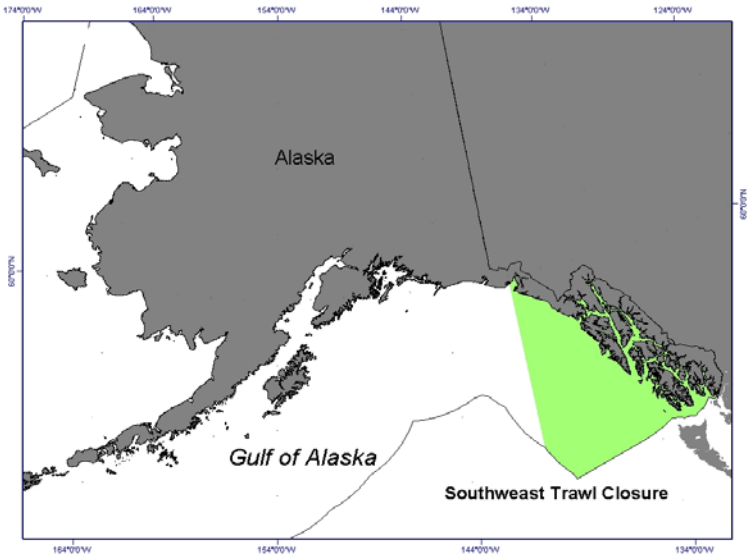


Figure 3-5 Southeast Outside trawl closure.



3.5.3 Marine Mammal Conservation Measures

Regulations implementing the FMP may include special groundfish management measures intended to afford species of marine mammals additional protection other than that provided by other legislation. These regulations may be especially necessary when marine mammals species are reduced in abundance. Regulations may be necessary to prevent interactions between commercial fishing operations and marine mammal populations when information indicates that such interactions may adversely affect marine mammals, resulting in reduced abundance and/or reduced use of areas important to marine mammals. These areas include breeding and nursery grounds, haul out sites, and foraging areas that are important to adult and juvenile marine mammals during sensitive life stages.

Regulations intended to protect marine mammals might include those that would limit fishing effort, both temporarily and spatially, around areas important to marine mammals. Examples of temporal measures are seasonal apportionments of TAC specifications. Examples of spatial measures could be closures around areas important to marine mammals. The purpose of limiting fishing effort would be to prevent harvesting excessive amounts of the available TAC or seasonal apportionments thereof at any one time or in any one area.

3.5.4 Gear Testing Exemptions

The Council may promulgate regulations establishing areas where specific types of fishing gear may be tested, to be available for use when the fishing grounds are closed to that gear type. Specific gear test areas contained in regulations that implement the FMP, and changes to the regulations, will be done by regulatory amendment. These gear test areas would be established in order to provide fishermen the opportunity to

ensure that their gear is in proper working order prior to a directed fishery opening. The test areas must conform to the following conditions:

1. depth and bottom type must be suitable for testing the particular gear type;
2. must be outside State waters;
3. must be in areas not normally closed to fishing with that gear type;
4. must be in areas that are not usually fished heavily by that gear type; and
5. must not be within a designated Steller sea lion protection area at any time of the year.

3.6 Catch Restrictions

This section describes the retention and utilization restrictions for the groundfish fisheries, including prohibited species restrictions and incentive programs to reduce bycatch.

3.6.1 Prohibited Species

Prohibited species identified in this FMP are Pacific halibut, Pacific herring, Pacific salmon, steelhead trout, king crab, and Tanner crab. Species identified as prohibited must be avoided while fishing groundfish and must be immediately returned to the sea with a minimum of injury when caught and brought aboard, except when their retention is authorized by other applicable law.

Groundfish species and/or species groups under this FMP for which the TAC has been reached shall be treated in the same manner as prohibited species.

3.6.1.1 Prohibited Species Donation Program

The Prohibited Species Donation Program authorizes the distribution of specified prohibited species, taken as bycatch in the groundfish trawl fisheries off Alaska, to economically disadvantaged individuals through a NMFS-authorized distributor selected by the Regional Administrator in accordance with regulations that implement the FMP. The program is limited to the following species:

1. Pacific salmon
2. Pacific halibut

3.6.1.2 Time and Area Closures to Reduce Bycatch Rates of Prohibited Species

The Secretary, after consulting with the Council, may identify and establish, by regulatory amendment, time/area closures to reduce bycatch rates of prohibited species. Closures of all or part of an area would require a determination by the Secretary that the closure is based on the best available scientific information concerning the seasonal distribution and abundance of prohibited species and bycatch rates of prohibited species associated with various directed groundfish fisheries or gear types. A time/area closure will be limited to the minimum size and duration, which the Secretary determines are reasonably necessary to accomplish the intent of the closure. Any time/area closure would be based upon a determination that it is necessary to prevent:

1. a continuation of relatively high bycatch rates of prohibited species with an area;

2. the take of an excessive share of prohibited species catch limits or bycatch allowances by vessels fishing within an area;
3. the closure of one or more directed fisheries for groundfish due to excessive prohibited species bycatch rates that occur in a specified fishery operating within an area; or
4. the premature attainment of specified prohibited species catch limits or bycatch allowances and associated foregone opportunity for vessels to harvest available groundfish.

3.6.2 Prohibited Species Catch Limits

Prohibited species catch is non-retainable catch. It can take the form of a prohibited or non-groundfish species and/or a groundfish species for which TAC has been achieved that is captured incidentally in groundfish fisheries. A PSC limit is an apportioned, non-retainable amount of fish provided to a fishery for bycatch purposes. The attainment of a PSC limit for a species will result in the closure of the appropriate fishery.

3.6.2.1 Pacific Halibut

The Council believes that discarding incidental catches of fish is wasteful and should be minimized. However, recognizing that in the groundfish fisheries halibut incidentally caught are managed outside this FMP, the treatment of halibut as a prohibited species is appropriate in the short term. Except as provided under the prohibited species donation program, retention of prohibited species captured while harvesting groundfish is prohibited to prevent covert targeting on these species. The prohibition removes the incentive that groundfish fishers might otherwise have to target on the relatively high valued prohibited species, and thereby, results in a lower incidental catch. It also eliminates the market competition that might otherwise exist between halibut fishers and groundfish fishers who might land halibut in the absence of the prohibition.

Halibut that are taken as bycatch in the trawl and fixed gear fisheries result in fishing mortality even though the FMP requires that these species be discarded. Bycatch survival rates of halibut are typically less than 100 percent and may approach zero for some fisheries and some gear.

When a PSC limit is reached, further fishing with specific types of gear or modes of operation during the year is prohibited in an area by those who take their PSC limit in that area. All other users and gear would remain unaffected.

However, when the fishery to which a PSC limit applies has caught an amount of prohibited species equal to that PSC limit, the Secretary may, by notice, permit some or all of those vessels to continue to engage in fishing for groundfish in the applicable regulatory area, under specified conditions. These conditions may include the avoidance of certain areas of prohibited species concentrations and will be determined on a case-by-case basis.

3.6.2.1.1 Apportionment and Seasonal Allocation of Pacific Halibut

Apportionments of PSC limits, and seasonal allocations thereof, will be determined annually by the Secretary of Commerce in consultation with the Council. Separate PSC limits may be established for specific gear.

PSC limits, apportionments, and seasonal allocations will be determined using the following procedure:

1. Prior to the October Council meeting. The GOA Groundfish Plan Team will provide the Council the best available information on estimated halibut bycatch and mortality rates in the target groundfish fisheries.

2. October Council meeting. While developing proposed groundfish harvest levels under Section 3.2.3, the Council will also review the need to control the bycatch of halibut and will, if necessary, recommend proposed halibut PSC mortality limits and apportionments thereof. The Council will also review the need for seasonal allocations of the halibut PSC.

   The Council will make proposed recommendations to the Secretary about some or all of the following:

   a. the regulatory areas and districts for which PSC mortality limits might be established;

   b. PSC for particular target fisheries and gear types;

   c. seasonal allocations by target fisheries, gear types, and/or regulatory areas and district;

   d. PSC allocations to individual operations; and

   e. types of gear or modes of fishing operations that might be prohibited once a PSC is reached.

   The Council will consider the best available information in doing so. Types of information that the Council will consider relevant to recommending proposed PSCs include:

   a. estimated change in biomass and stock condition of halibut;

   b. potential impact on halibut stocks;

   c. potential impacts on the halibut fisheries;

   d. estimated bycatch in years prior to that for which the halibut PSC mortality limit is being established;

   e. expected change in target groundfish catch;

   f. estimated change in target groundfish biomass;

   g. methods available to reduce halibut bycatch;

   h. the cost of reducing halibut bycatch; and

   i. other biological and socioeconomic factors that affect the appropriateness of specific bycatch measures in terms of objectives.

   Types of information that the Council will consider in recommending seasonal allocations of halibut include:

   a. seasonal distribution of halibut;

   b. seasonal distribution of target groundfish species relative to halibut distribution;

   c. expected halibut bycatch needs on a seasonal basis relevant to changes in halibut biomass and expected catches of target groundfish species;

   d. expected bycatch rates on a seasonal basis;

   e. expected changes in directed groundfish fishing seasons;

   f. expected start of fishing effort; and

   g. economic effects of establishing seasonal halibut allocations on segments of the target groundfish industry.

3. As soon as practicable after the Council's October meeting, the Secretary will publish the Council's recommendations as a notice in the *Federal Register*. Information on which the recommendations are based will also be published in the *Federal Register* or otherwise made available by the Council.

Public comments will be invited by means specified in regulations implementing the FMP for a minimum of 15 days.

4. Prior to the December Council meeting. The Plan Team will prepare for the Council a final Stock Assessment and Fishery Evaluation (SAFE) report under Section 3.2.3 which provides the best available information on estimated halibut bycatch rates in the target groundfish fisheries and recommendations for halibut PSCs. If the Council requests, the Plan Team also may provide PSC apportionments and allocations thereof among target fisheries and gear types, and an economic analysis of the effects of the apportionments.

5. December Council meeting. While recommending final groundfish harvest levels, the Council reviews public comments, takes public testimony, and makes final decisions on annual halibut PSC limits and seasonal apportionments, using the factors set forth under (2) above relevant to proposed PSC limits, and concerning seasonal allocations of PSC limits. The Council will provide recommendations, including no change for the new fishing year, to the Secretary of Commerce for review and implementation.

6. As soon as practicable after the Council's December meeting, the Secretary will publish the Council's final recommendations as a notice of final harvest specifications in the *Federal Register*. Information on which the final harvest specifications are based will also be published in the *Federal Register* or otherwise made available by the Council.

3.6.3 Retention and Utilization Requirements

3.6.3.1 Utilization of Pollock

Roe-stripping of pollock is prohibited, and the Regional Administrator is authorized to issue regulations to limit this practice to the maximum extent practicable. It is the Council's policy that the pollock harvest shall be utilized to the maximum extent possible for human consumption.

3.6.3.2 Improved Retention/Improved Utilization Program

Minimum retention requirements

All vessels participating in the GOA groundfish fisheries are required to retain all catch of pollock, Pacific cod, and shallow water flatfish when directed fishing for those species is open, regardless of gear type employed and target fishery. When directed fishing for pollock, Pacific cod, or shallow water flatfish is prohibited, retention of those species is required up to any maximum retainable amount in effect for these species, and these retention requirements are superseded if retention of pollock, Pacific cod, or shallow water flatfish is prohibited by other regulations.

No discarding of whole fish of these species is allowed, either prior to or subsequent to that species being brought on board the vessel, except as permitted in the regulations. At-sea discarding of any processed product from pollock, Pacific cod, or shallow water flatfish is also prohibited, unless required by other regulations.

Minimum utilization requirements

All pollock, Pacific cod, and shallow water flatfish caught in the GOA must be either 1) processed at sea subject to minimum product recovery rates and/or other requirements established by regulations implementing the FMP, or 2) delivered in their entirety to onshore processing plants for which similar processing requirements are implemented by State regulations.

3.6.3.3 Size Limits

A commercial size limit for a particular species group may be necessary to afford the opportunity for the species to reproduce or to direct fishing toward an optimal size given existing markets and processing capabilities. Should the Council desire a size limit, the FMP will require an amendment specifying a specific length and the supporting rationale for the limit.

3.6.4 Bycatch Reduction Programs

3.6.4.1 Prohibited Species Catch

The Secretary of Commerce, after consultation with the Council, may implement by regulation measures that provide incentives to individual vessels to reduce bycatch rates of prohibited species for which PSC limits are established under Section 3.6.2. The intended effect of such measures is to increase the opportunity to harvest groundfish TACs before established PSC limits are reached by encouraging individual vessels to maintain average bycatch rates within acceptable performance standards and discourage fishing practices that result in excessively high bycatch rates.

3.7 Share-based Programs

This section describes the share-based programs in place in the Gulf of Alaska.

3.7.1 Fixed Gear Sablefish Fishery

The directed fixed gear sablefish fishery is managed under an Individual Fishing Quota program, implemented in 1994-1995. This form of limited entry replaced the open access fisheries for sablefish in the GOA.

3.7.1.1 Definitions

For purposes of Section 3.7.1, the following definitions of terms apply:

Person means any individual who is a citizen of the U.S. or any corporation, partnership, association, or other entity (whether or not organized or existing under the laws of any state) that meets the requirements set forth in 46 CFR Part 67.03, as applicable.

An Individual means a natural person who is not a corporation, partnership, association, or other entity.

Quota shares (QS) are equal to a person's fixed gear landings (qualifying pounds) for each area fished.

Quota Share Pool is the total amount of quota share in each management area. The quota share pool may change over time due to appeals, enforcement, or other management actions.

Individual Fishing Quota means the annual poundage of fish derived by dividing a person's quota share into the quota share pool and multiplying that ratio by the annual fixed gear TAC for each management area.

Fixed Gear is defined to include all hook and line fishing gears (longlines, jigs, handlines, troll gear, and pot gear). For purposes of initial allocation, legal pot gear will be counted.

Catcher boat or catcher vessel means any vessel that delivers catch or landing in an unfrozen state.

Freezer longliner means any vessel engaged in fishing in the fixed gear fishery which, during a given trip, utilizes freezer capacity and delivers some or all of its groundfish catch in a frozen state.

Qualified crewmember is defined as any person that has acquired commercial fish harvesting time at sea (i.e., fish harvesting crew) equal to 5 months of any commercial fish harvesting activity in a fishery in state or federally managed waters of the U.S.. Additionally, any individual who receives an initial allocation of quota share will be considered a bona fide crew member.

3.7.1.2 Management Areas

Quota shares and IFQs are made available for each of the management areas identified for the GOA: the Western Gulf, Central Gulf, West Yakutat, and the East Yakutat/Southeast Outside management areas.

3.7.1.3 Initial Allocation of Quota Shares

3.7.1.3.1 Initial Recipients

1. Initial assignments of quota shares are made to:
   a. a qualified person who is a vessel owner who meets the requirements in this section; or
   b. a qualified person who meets the requirements of this section engaged in a lease of a fishing vessel (written or verbal) or other "bare-boat charter" arrangement in order to participate in the fishery. (For instances identified under this section, the qualified person shall receive full credit for deliveries made while conducting the fishery under such a lease or arrangement.)
2. Initial quota shares for sablefish are assigned only to persons who meet all other requirements of this section and who have landed those species in any one of the following years: 1988, 1989, or 1990. These three years shall be known as the quota share qualifying years.
3. Quota shares are assigned initially for each management subarea to qualified persons based on recorded landings, as documented through fish tickets or other documentation for fixed gear landings. Historical catch of sablefish is counted from 1985 through 1990. This historical period is known as the quota share base period. For each management subarea, NMFS will select a person's best five years (subject to approval of the person involved) from the quota share base period to calculate their quota shares.
4. The sum of the catch in each person's five selected years for each area shall equal that person's quota shares for that area. All quota share in any area are added together to form the "Quota Share Pool" for that area.

3.7.1.3.2 Vessel Categories

Quota shares and IFQs shall be assigned by vessel category as follows:

1. Freezer Longliner Shares:

   A vessel is determined to be a freezer longliner in any year, if during that year it processed (froze) fixed gear (as defined above) caught groundfish. If a vessel is determined to be a freezer longliner and that vessel was used in the most recent calendar year of participation by the owner, through September 25, 1991, then all qualifying pounds landed by that vessel owner during the qualifying years shall be assigned as freezer longliner shares, unless the owner also participated in the most recent year through September 25, 1991, operating only as a catcher vessel, then shares will be assigned to separate categories, in proportion to the catch made aboard each of the vessels.

2. Catcher Vessel Shares:

   a. All landings made during the quota share base period by a vessel owner, whose last vessel that participated in a fixed gear fishery through September 25, 1991, is determined to be a catcher vessel, shall be allocated catcher vessel quota shares.

   b. There are two categories of catcher vessel shares for the sablefish QS/IFQ fishery:

      i. vessels less than or equal to 60 ft in length overall, and

      ii. vessels greater than 60 ft in length overall.

   c. For initial allocation of catcher vessel quota shares:

      i. if, during the last year of participation in a fixed gear fishery through September 25, 1991, a quota share recipient simultaneously owned or leased two or more vessels on which sablefish were landed, and those vessels were in different vessel categories, then the quota share allocation is for each vessel category and may not be combined into a single category.

      ii. if a quota share recipient bought or sold vessels in succession during the qualifying period, and to the extent the quota share recipient operations were in one vessel category during one year and the next vessel owned was in another vessel category, the quota share is combined and applied to the latest vessel category of ownership as of September 25, 1991.

3.7.1.3.3 Quota Share Blocks

1. All initial allocations of sablefish regular quota share and community development quota compensation quota share initially issued in area(s) where he/she also receives regular quota share, which would result in IFQs of less than 20,000 pounds in the first year of the program are issued as quota share "Blocks," except for (3) below.

2. All initial allocations of sablefish quota share which would result in IFQs of 20,000 pounds or more in the first year of the program are issued as normal quota share.

3. All initial allocations of sablefish community development quota compensation quota share issued in areas where he/she did not also receive regular quota share are issued as unblocked quota share.

3.7.1.4 Transfer Provisions

1. Any person owning freezer longliner quota shares may sell or lease those quota shares to any other qualified person for use in the freezer longliner category.

2. Any person owning catcher vessel quota shares may sell those quota shares to any person meeting the provisions outlined in this section. Ten percent of a person's catcher vessel quota shares may be leased during the first three years following implementation.

3. Any person owning community development quota compensation quota share may transfer those quota shares to any other qualified person for IFQ quota share across catcher vessel categories. These transfers may occur through March 15, 1996. Further, regular unblocked quota share as set forth in Section 3.7.1.3.3(3) above may be transferred across catcher vessel categories.

4. In order to purchase or lease quota share, the purchaser must be an individual who is a U.S. citizen and a bona fide fixed gear crew member. Additionally, persons who received an initial allocation of catcher vessel quota share may purchase catcher vessel quota share and/or IFQs.

5. Quota shares, or IFQs arising from those quota shares, for any management area may not be transferred to any other management area or between the catcher vessel and the freezer vessel categories. Quota shares, or IFQs arising from those quota shares, initially issued to Category B vessels may be used on Category C vessels, except in the Southeast management area where only blocked Category B quota share equivalent to less than 5,000 lbs IFQ (based on 1996 quotas) may be used on Category C vessels.

6. The Secretary may, by regulation, designate exceptions to this section to be employed in case of personal injury or extreme personal emergency which allow the transfer of catcher vessel quota shares or IFQs for limited periods of time.

7. Quota share designated as a "block" may only be traded in its entirety and may not be divided into smaller quota share units. Blocks of quota share representing IFQs of less than 5,000 lbs in the initial allocation may be combined or "swept-up", to form larger blocks, as long as the consolidated block does not result in IFQs greater than 5,000 lbs.

3.7.1.5 Use and Ownership Provisions

1. Fish caught with freezer longliner IFQs may be delivered frozen or unfrozen.

2. Fish caught with catcher vessel quota shares may not be frozen aboard the vessel utilizing those quota shares.

3. Sablefish IFQ resulting from quota share assigned to vessel categories B and C may be used on a vessel with processing capacity as long as processed sablefish or halibut is not on the vessel during that same trip. Further, non-IFQ species may be processed on a vessel using sablefish IFQ resulting from quota share assigned to vessel categories B and C.

4. In order to use catcher boat IFQs the user must: 1) own or lease the quota share, 2) be a U.S. citizen, 3) be a bona fide crew member, 4) be aboard the vessel during fishing operations, and 5) sign the fish ticket upon landing except as noted in (5) below, or in emergency situations.

5. Persons, as defined in Section 3.7.1.1, who receive initial catcher vessel quota share may utilize a hired skipper to fish their quota providing the person owns the vessel upon which the quota share will be used, or the vessel is owned by a person with whom the quota share holder is affiliated through membership in a corporation or partnership. These initial recipients may purchase up to the total share allowed for the area. There shall be no leasing of such catcher vessel quota share other than as provided for in Section 3.7.1.4 above. For the sablefish fishery east of 140° W. longitude and for the halibut fishery in Area 2C, the above allowance for hired skippers applies only to corporations, partnerships, and other collective entities. *(Additional shares purchased by these corporations, partnerships, or other entities for the are east of 140° W. longitude will not be exempted from the provisions of this section, nor does this exception apply to individuals using catcher vessel IFQs east of 140° W. longitude.)*

   This provision will cease upon the sale or transfer of quota share or upon any change in the identity of the corporation, partnership, or estate as defined below:

a. Corporation: Any corporation that has no change in membership, except a change caused by the death of a corporate member providing the death did not result in any new corporate member. Additionally, corporate membership is not deemed to change if a corporate member becomes legally incapacitated and a trustee is appointed to act on his behalf, nor is corporate membership deemed to have changed if the ownership shares among existing members change, nor is corporate membership deemed to have changed if a member leaves the corporation.

b. Partnership: Any partnership that has no change in membership, except a change caused by the death of a partner providing the death did not result in any new partners. Additionally, a partnership is not deemed to have changed if a partner becomes legally incapacitated and a trustee is appointed to act on his behalf, nor is a partnership deemed to have changed if the ownership shares among existing partners change, nor is a partnership deemed to have changed if a partner leaves the partnership.

c. Estate: Any estate that has not been disposed to a legal heir.

d. Individual: Any individual as defined in Section 3.7.1.1.

6. For sablefish each qualified person or individual may own, hold, or otherwise control, individually or collectively, but may not exceed, 3,229,721 units of quota share for the GOA and BSAI; additionally, quota share holdings in the areas east of 140° W. longitude (East Yakutat and Southeast Outside) shall not exceed 688,485 units of quota share for that management area.

7. Any person who receives an initial assignment of quota shares in excess of the limits set forth in (6) of this section shall:

a. be prohibited from purchasing, leasing, holding or otherwise controlling additional quota shares until that person's quota share falls below the limits set forth in (6) above, at which time each such person shall be subject to the limitations of paragraph (6) above; and

b. be prohibited from selling, trading, leasing or otherwise transferring any interest, in whole or in part, of an initial assignment of quota share to any other person in excess of the limitations set forth in (6) above.

8. For sablefish, no more than 1 percent of the combined GOA and BSAI quota may be taken on any one vessel, and no more than 1 percent of the TAC east of 140° W. longitude (East Yakutat/ Southeast Outside), may be landed on the same vessels, except that persons who received an initial allocation of more than 1 percent overall ownership level (or 1 percent in the area east of 140° W. longitude) may continue to fish their quota share on a single vessel.

9. Persons must control IFQs for the amount to be caught before a trip begins, with the exception that limited overages will be allowed as specified in an overage program approved by NMFS and the International Pacific Halibut Commission.

10. Quota Share Block Provisions

a. A person may own and use up to two Blocks in each management area.

b. Persons owning two Blocks in a given management area may not use normal quota share in that area.

c. Persons who own less than two Blocks in an area may own and use normal quota share up to the limits specified under this program, noting that the limit applies to both normal quota share and quota share embedded in Blocks.

3.7.1.6 Annual Allocation of Quota Share/Individual Fishing Quota

Individual fishing quotas are determined for each calendar year for each person by applying the ratio of a person's quota share to the quota share pool for an area to the annual fixed gear total allowable catch for each management area, after adjusting for the CDQ program. In mathematical terms:

IFQs = (QS / QS pool) x fixed gear TAC.

3.7.1.7 General Provisions

1. For IFQ accounting purposes:
   a. The sale of catcher vessel caught sablefish or halibut to other than a legally registered buyer is illegal, except that direct sale to dockside customers is allowed provided the fisher is a registered buyer and proper documentation of such sales is provided to NMFS.
   b. Frozen product may only be off-loaded at sites designated by NMFS for monitoring purposes;
   c. Persons holding IFQs and wishing to fish must check-in with NMFS or their agents prior to entering any relevant management area, additionally any person transporting IFQ caught fish between relevant management areas must first contact NMFS or their agents.
2. Quota shares and IFQs arising from those quota shares may not be applied to: 1) trawl-caught sablefish; or 2) sablefish harvested using pots in the GOA.
3. Quota shares are a harvest privilege, and good indefinitely. However, they constitute a use privilege which may be modified or revoked by the Council and the Secretary at any time without compensation.
4. Discarding of sablefish is prohibited by persons holding sablefish IFQs and those fishing under the CDQ program.
5. Any person retaining sablefish or halibut with commercial fixed gear must own or otherwise control IFQs.
6. Persons holding IFQs may utilize those privileges at any time during designated seasons. Retention of fixed-gear caught sablefish or any halibut is prohibited during closed seasons. Seasons will be identified by the Council and the International Pacific Halibut Commission on an annual basis.

3.7.1.8 Community Quota Share Purchases

Specified GOA coastal communities are eligible to hold commercial catcher boat sablefish quota share under the IFQ Program as defined and described in this section. Communities are subject to the provisions of the IFQ Program as described in Section 3.7.1 unless otherwise described in this section.

3.7.1.8.1 Eligible Communities

Eligible communities are those that meet the following qualifying criteria: 1) populations of less than 1,500; 2) no road access to larger communities; 3) direct access to saltwater; and 4) a documented historic participation in the halibut or sablefish fisheries and are listed in Federal regulation. Communities not listed in Federal regulation must apply to the Council to be approved for participation in the program and will be evaluated using the above criteria.

The administrative entity permitted to hold the quota share for eligible communities must be a: 1) new non-profit entity; or 2) a new non-profit entity formed by an aggregation of several eligible communities. Eligible communities may also designate a new regional or Gulf-wide administrative entity to act as a trustee to manage quota share for individual eligible communities.

3.7.1.8.2 Management Areas

Eligible communities may purchase and hold quota shares and IFQs in each of the following management areas identified for the GOA: Western GOA, Central GOA, West Yakutat, and East Yakutat/Southeast Outside.

3.7.1.8.3 Use and Ownership Provisions

1. Individual and Cumulative Community Use Caps

    a. For sablefish, each qualified administrative entity representing an eligible community or communities may own, hold, or otherwise control, but may not exceed, 1 percent of the combined quota share for the GOA and BSAI on behalf of that community; additionally quota share holdings in the area east of 140° W. longitude (East Yakutat/Southeast Outside) shall not exceed 1 percent of the quota share or IFQs for that management area.

    b. For sablefish, all administrative entities representing eligible communities may own, hold, or otherwise control, collectively, but may not exceed, 3 percent of the Southeast, West Yakutat, Central Gulf, or Western Gulf quota share in each of the first seven years of the program, with a 21 percent total in each IFQ regulatory area, unless modified by Council review by 2009.

2. Quota Share Block Provisions

    a. Each eligible community may own and use up to five quota share blocks in each management area;

    b. Eligible communities are restricted to owning and using blocks of quota share which exceed 5,000 lbs IFQ (based on 1996 quotas). This is equivalent to: 33,270 QS units in Southeast; 43,490 QS units in West Yakutat; 46,055 QS units in Central GOA; and 48,410 QS units in the Western GOA management area.

3. Vessel Size Provisions

    The vessel size category designations for catcher vessel quota shares (Category B and C) do not apply to the quota share when it is owned and used by eligible communities.

3.7.1.8.4 Transfer Provisions

1. Eligible communities owning quota shares may lease the IFQs arising from those quota shares only to residents of the ownership community.

2. Any eligible community owning catcher vessel quota shares may lease, but may not exceed, 50,000 pounds of sablefish IFQs per lessee annually. The 50,000 pound limit is inclusive of any quota owned by the individual (lessee).

3. No more than 50,000 pounds of any IFQs leased by an eligible community may be taken on any one vessel annually, inclusive of any IFQ owned by the individual leasing the IFQs.

4. Eligible communities owning catcher vessel quota shares may sell those quota shares to any other eligible community or any person meeting the provisions outlined in Section 3.7.1.4.

5. Eligible communities may only sell their quota share for one of the following purposes:

   a. generating revenues to sustain, improve, or expand the program

   b. liquidating the entity's quota share assets for reasons outside the program

   Should an eligible community sell its quota share for purposes consistent with (b) above, an administrative entity would not be qualified to purchase and own quota share on behalf of that community for a period of three years.

3.8 Delegated and Flexible Management Authority

3.8.1 Regulation Delegated to the State of Alaska

3.8.1.1 Demersal Shelf Rockfish Assemblages

The TAC for demersal shelf rockfish in the Eastern regulatory area is specified by the Council each year. The State of Alaska will manage State registered vessels fishing for demersal shelf rockfish in the Eastern regulatory area with Council oversight. Under this oversight, the State's management regime for demersal shelf rockfish in the Eastern regulatory area will be directed at managing these rockfish stocks within the TAC specified by the Council. Such State regulations are in addition to and stricter than Federal regulations. They are not in conflict with the FMP as long as they are 1) consistent with specific provisions of the goals and objectives of the FMP, and 2) result in a total harvest of demersal shelf rockfish in the Eastern regulatory area at a level no greater than that provided by the FMP. Such State regulations will apply only to vessels registered under the laws of the State of Alaska.

Regulatory changes proposed by the Alaska Board of Fisheries, which are related to the management of demersal shelf rockfish, will be reviewed by NMFS and the Council prior to their adoption to assure that any such proposed changes are consistent with the goals and objectives of the FMP.

Under Council oversight, the following categories of regulations are authorized by the FMP to be applied by the State to vessels in the demersal shelf rockfish fishery:

- directed fishing standard for demersal shelf rockfish,
- inseason adjustments,
- seasons,
- seasonal apportionments of quotas,
- gear specifications,
- trip limits,
- directed fishing quotas, and
- management areas.

The following categories of regulations will be maintained as Federal regulations, unless specifically exempted, that must be complied with by Federally permitted vessels in this fishery:

- notices establishing final TACs,
- definitions (except the directed fishing standard) for demersal shelf rockfish,

- relation to other laws,
- permits,
- recordkeeping and reporting,
- general prohibition,
- penalties,
- harvest limits,
- prohibited species catch limits,
- measures to manage designated prohibited species, and
- observer requirements.

3.8.2 Flexible Management Authority

3.8.2.1 Inseason Adjustments

Harvest levels for each groundfish species or species group that are set by the Council for a new fishing year are based on the best biological, ecological, and socioeconomic information available. The Council finds, however, that new information and data relating to stock status may become available to the Regional Administrator and/or the Council during the course of a fishing year which warrant inseason adjustments to a fishery.

Such changes in stock status might not have been anticipated or were not sufficiently understood at the time harvest levels were being set. Such changes may become known from events within the fishery as it proceeds, or they may become known from analysis of scientific survey data. Certain changes warrant swift action by the Regional Administrator to protect the resource from biological harm by instituting gear modifications or adjustments through closures or restrictions. Other changes warrant action to provide greater fishing opportunities for the industry by instituting time/area adjustments through openings or extension of a season beyond a scheduled closure.

The need for inseason action may be related to several circumstances. For instance, certain target or bycatch species may have decreased in abundance. When new information indicates that a species has decreased in abundance, allowing a fishery to continue to a harvest level now known to be too high could increase the risk of overfishing that species. Conservation measures limited to establishing prohibited species catch limits for such prohibited species may be necessary during the course of the fishery to prevent jeopardizing the well-being of prohibited species stocks.

Similarly, current information may indicate that a prohibited species is more abundant than was anticipated when limits were set. Closing a fishery on the basis of the preseason PSC limit that is proven to be too low would impose unnecessary costs on the fishery. Increasing the PSC limits may be appropriate if such additional mortality inflicted on the prohibited species of concern would not impose detrimental effects on the stock or unreasonable costs on a fishery that utilize the prohibited species. However, adjustments to TAC or PSC limits that are not initially specified on the basis of biological stock status is not appropriate.

The Council finds that inseason adjustments are accomplished most effectively by management personnel who are monitoring the fishery and communicating with those in the fishing industry who would be directly affected by such adjustments. Therefore, the Council authorizes the Secretary, by means of his or her delegation to the Regional Administrator of NMFS, to make inseason adjustments to conserve fishery

resources on the basis of all relevant information. Using all available information, he or she may extend, open, or close fisheries in all or part of a regulatory area, or restrict the use of any type of fishing gear as a means of conserving the resource. He or she may also change any previously specified TAC or PSC limit if such are proven to be incorrectly specified on the basis of the best available scientific information or biological stock status. Such inseason adjustments must be necessary to prevent one of the following occurrences:

a. the overfishing of any species or stock of fish, including those for which PSC limits have been set; and/or

b. the harvest of a TAC for any groundfish, the taking of a PSC limit for any prohibited species, or the closure of any fishery based on a TAC or PSC limit that, on the basis of currently available information, is found by the Secretary to be incorrectly specified.

The types of information that the Regional Administrator must consider in determining whether conditions exist that require an inseason adjustment or action are described as follows, although he or she is not precluded from using information not described but determined to be relevant to the issue:

a. the effect of overall fishing effort within an area;

b. catch per unit of effort and rate of harvest;

c. relative abundance of stocks within an area;

d. the condition of a stock in all or part of a regulatory area; and

e. any other factor relevant to the conservation and management of groundfish species or any incidentally-caught species that are designated as a prohibited species or for which a PSC limit has been specified.

The Regional Administrator is constrained, however, in his or her choice of management responses to prevent potential overfishing by having to first consider the least restrictive adjustments to conserve the resource. The order in which the Regional Administrator must consider inseason adjustments to prevent overfishing are specified as: 1) any gear modification that would protect the species in need of conservation protection, but that would still allow fisheries to continue for other species; 2) a time/area closure that would allow fisheries for other species to continue in non-critical areas and time periods; and 3) total closure of the management area and season.

The procedure that the Secretary must follow requires that the Secretary publish a notice of proposed adjustments in the *Federal Register* before they are made final, unless the Secretary finds for good cause that such notice is impracticable or contrary to the public interest. If the Secretary determines that the prior comment period should be waived, he or she is still required to request comments for 15 days after the notice is made effective, and respond to any comments by publishing in the *Federal Register* either notice of continued effectiveness or a notice modifying or rescinding the adjustment.

To effectively manage each groundfish resource throughout its range, the Regional Administrator must coordinate inseason adjustments, when appropriate, with the State of Alaska to assure uniformity of management in both State and Federal waters.

Any inseason time/area adjustments made by the Regional Administrator will be carried out within the authority of this FMP. Such action is not considered to constitute an emergency that would warrant a plan amendment within the scope of section 305(e) of the Magnuson-Stevens Act. Any adjustments will be made by the Regional Administrator by such procedures provided under existing law. Any inseason adjustments that are beyond the scope of the above authority will be accomplished by emergency regulations as provided for under section 305(e) of the Magnuson-Stevens Act.

3.8.2.2 Measures to Address Identified Habitat Problems

The Secretary, upon the recommendation of the Council, may:

a. propose regulations establishing gear, timing, or area restrictions for purposes of protecting particular habitats of species in the GOA groundfish fishery;

b. propose regulations establishing area or timing restrictions to prevent the harvest of fish in contaminated areas; and/or

c. propose regulations restricting disposal of fishing gear by vessels.

The following is a list of "real time" possible actions or strategies the Council may wish to take in the future, based on concerns expressed and data presented or referenced in this FMP. Actions taken must also be consistent with the goals and objectives of the FMP.

- Hold hearings to gather information or opinions about specific proposed projects having a potentially adverse effect on habitats of species in the GOA groundfish fishery.
- Write comments to regulatory agencies during project review periods to express concerns or make recommendations about issuance or denial of particular permits.
- Respond to "Calls for Information" from the State of Alaska Minerals Management Service regarding upcoming oil and gas lease areas affecting the GOA/Cook Inlet areas.
- Identify research needs and recommend funding for studies related to habitat issues of new or continuing concern and for which the data are limited.
- Establish review panels or an ad hoc task force to coordinate or screen habitat issues.
- Propose to other regulatory agencies additional restrictions on industries operating in the fisheries management area, for purposes of protecting the habitat against loss or degradation.
- Joint as *amicus* in litigation brought in furtherance of critical habitat conservation, consistent with FMP goals and objectives.

3.8.2.3 Vessel Safety

The Council will consider, and may provide for, temporary adjustments regarding access to the fishery for vessels otherwise prevented from harvesting because of weather or other ocean conditions affecting the safety of the vessels, after consultation with the U.S. Coast Guard and persons utilizing the fishery.

3.9 Monitoring and Reporting

3.9.1 Recordkeeping and Reporting

The Council and NMFS must have the best available biological and socioeconomic information with which to carry out their responsibilities for conserving and managing groundfish resources, as well as other fish resources, such as crab, halibut, and salmon, that are incidentally caught in the groundfish fishery. This information is used for making inseason and inter-season management decisions that affect these resources as well as the fishing industry that utilize them. This information is also used to judge the effectiveness of regulations guiding these decisions. The Council will recommend changes to regulations when necessary on the basis of such information.

The need for the Council and NMFS to consider the best available information is explicit in the goals and objectives as established by the Council and contained in the FMP. They are also explicit in the Magnuson-Stevens Act, Executive Order 12866, the Regulatory Flexibility Act, the National Environmental Policy Act, and other applicable law. The Secretary, therefore, will require segments of the fishing industry to keep and report certain records as necessary to provide the Council and NMFS with the needed information to accomplish these goals and objectives. The Secretary may implement and amend regulations at times to carry out these requirements after receiving Council recommendations to do so, or at other times as necessary to accomplish these goals and objectives. Regulations will be proposed and implemented in accordance with the Administrative Procedure Act, the Magnuson-Stevens Act, and other applicable law.

Information on catch and production, effort, and price

In consultation with the Council, the Secretary may require recordkeeping that is necessary and appropriate to determine catch, production, effort, price, and other information necessary for conservation and management of the fisheries. Such requirements may include the use of catch and/or product logs, product transfer logs, effort logs, or other records. The Secretary may require the industry to submit periodic reports or surveys of catch and fishery performance information derived from the logs or other recordkeeping requirements.

Recordkeeping and reporting is required of operators of catcher vessels, catcher/processor vessels, mothership processor vessels, and by responsible officers of shoreside processor plants. Such requirements will be contained in regulations implementing this FMP.

3.9.1.1 At-sea Processor Vessels

The Secretary may require catcher/processor vessels and mothership processor vessels to submit check-in and check-out reports for any Federal statistical area and the U.S. exclusive economic zone. Such requirements will be contained in regulations implementing this FMP.

3.9.2 Observer Program

The Council and NMFS must have the best available biological and socioeconomic information with which to carry out their responsibilities for conserving and managing groundfish resources. To address management and scientific information needs, NMFS, in consultation with the Council, will require U.S. fishing vessels that catch groundfish from the EEZ or receive groundfish from the EEZ, and shoreside processors that receive groundfish caught in the EEZ, to accommodate observers certified by NMFS. Provisions of the North Pacific Groundfish Observer Program will be developed in consultation with the Council and established in regulations. The purpose of the groundfish observer program is to verify catch composition and quantity, including those discarded at sea, and collect biological information on marine resources.

3.10 Council Review of the Fishery Management Plan

3.10.1 Procedures for Evaluation

The Council will maintain a continuing review of the fisheries managed under this FMP through the following methods:

l. Maintain close liaison with the management agencies involved, usually the Alaska Department of Fish and Game and NMFS, to monitor the development of the fisheries and the activity in the fisheries.

2. Promote research to increase their knowledge of the fishery and the resource, either through Council funding or by recommending research projects to other agencies.

3. Conduct public hearings at appropriate times and in appropriate locations to hear testimony on the effectiveness of the management plans and requests for changes.

4. Consider all information gained from the above activities and develop, if necessary, amendments to the FMP. The Council will also hold public hearings on proposed amendments prior to forwarding them to the Secretary for possible adoption.

3.10.2 Schedule for Review

Adaptive management requires regular and periodic review. Unless specified below, all critical components of the FMP will be reviewed by the Council at such time as a supplement to the programmatic environmental impact statement on the groundfish fisheries is anticipated, or as otherwise warranted. Following the Council's review, components of the FMP may be identified that should be further examined in the programmatic analysis.

Management Approach

Objectives identified in the management policy statement (Section 2.2) will be reviewed annually by the Council. The Council will also review, modify, eliminate, or consider new issues, as appropriate, to best carry out the goals and objectives of the management policy.

Essential Fish Habitat Components

To incorporate the regulatory guidelines requirement for review and revision of essential fish habitat (EFH) FMP components, the Council will conduct a complete review of all the EFH components of each FMP once every 5 years and will amend those EFH components to include new information.

In between each five-year comprehensive review, the Council will utilize its annual FMP amendment cycle to solicit proposals on habitat areas of particular concern and/or conservation and enhancement measures to minimize the potential adverse effects from fishing. Those proposals that the Council endorses should be developed independent of the five-year comprehensive EFH review cycle.

An annual review of existing and new EFH information will be conducted and this information will be provided to the GOA Groundfish Plan Team for their review during the annual SAFE report process. This information could be included in the "Ecosystems Considerations" chapter of the SAFE report.

Chapter 4 Description of Stocks and Fishery

A description of the stocks that are managed as part of the Fishery Management Plan (FMP) for the Groundfish of the Gulf of Alaska (GOA) is contained in Section 4.1, including their status and trends. Section 4.2 describes the habitat of the GOA management area, defines essential fish habitat (EFH) for each of the managed species and provides recommendations, and describes habitat areas of particular concern. Fishing activities that affect the groundfish stocks are addressed in Section 4.3, including the history of exploitation in the GOA, and a description of the commercial, subsistence, and recreational fisheries for groundfish. Section 4.4 examines the economic and socioeconomic characteristics of the groundfish fisheries, and Section 4.5 describes fishing communities.

4.1 Stocks

4.1.1 Description of Groundfish Stocks

The relative abundance of fishes in the cod family (Gadidae) is different in the GOA compared to the other regions. Pacific hake (*Merluccius productus*), the most abundant of the cod-like fishery off Washington-California, is present only in the southern portion of the GOA and generally not in commercial quantities. Pollock (*Theragra chalcogramma*), the dominant "cod" and largest element in the groundfish biomass of the Bering Sea, is much less abundant in the GOA and becomes progressively scarce to the south until it is practically absent off Oregon. However, the abundance of pollock in the GOA increased by perhaps an order of magnitude during the past decade coincident with a reduction in the abundance of Pacific ocean perch. The abundance of pollock declined to low levels in 1985-87, primarily as the result of poor recruitment from 1980 and 1981 year classes. Pollock currently comprises the largest exploitable biomass within the gadoid community in the GOA. Pacific cod (*Gadus macrocephalus*) may reach its greatest coastwide abundance in the GOA.

Another groundfish that is the target of fisheries in the GOA is sablefish (*Anoplopoma fimbria*). Sablefish, which was depressed as a result of intensive fishing by foreign fleets in the 1960s and 1970s, recovered to high levels of abundance through 1988 due to the strong 1977 year class and have declined each year through 1999. Weak recruitment has led to projections of continued decline. Sablefish are found from California waters northward into the GOA and Bering Sea, but this species reaches its greatest abundance in the GOA.

Many of the flounders present in the GOA also occur in the Bering Sea and Washington-California region; however, the relative abundance of different species varies greatly between areas. In the Bering Sea yellowfin sole (*Limanda aspera*) dominates the flounder community, but is comparatively scarce in the Gulf and absent off Washington-California. Petrale sole (*Eopsetta jordani*) and English sole (*Parophrys vetulus*) are important components of the flounder community off Washington-California, but they are scarce in the GOA and for all practical purposes absent in the Bering Sea. The arrowtooth flounder, or so-called turbot (*Atheresthes stomias*), is widely distributed along the Pacific and Bering Sea coasts of the United States and appears to comprise the largest part of the exploitable biomass of flounders in the GOA. Other abundant flounders in the GOA include Pacific halibut (*Hippoglossus stenolepis*), which reaches its greatest abundance there and off British Columbia (and which is not managed in this FMP); northern rocksole (*Lepidopsette polyxystra*) and southern rocksole (*L. bilineata*); starry flounder (*Platichthys stellatus*); flathead sole (*Hippoglossoides elassodon*); rex sole (*Glyptocephalus zachirus*); and, in deep water, the Dover sole (*Microstomus pacificus*).

The most diverse species in the GOA is the rockfish group (genus *Sebastes* and *Sebastolobus*). Two species of *Sebastolobus* and at least 32 species of *Sebastes* have been identified in this area. Several species of rockfish are of significant commercial interest, including the Pacific ocean perch (*S. alutus*), shortraker rockfish (*S. borealis*), rougheye rockfish (*S. aleutianus*), dusky rockfish (*S. variabilis*), northern rockfish (*S. polyspinus*), and yelloweye rockfish (*S. ruberrimus*). Pacific ocean perch was the subject of a substantial foreign and domestic trawl fishery from the 1960s through the mid-1980s. For management purposes, rockfish are classified into four distinct assemblages. Thornyhead rockfish are managed independently, and *Sebastes* rockfish are classified into three assemblages based on their habitat and distribution. These assemblages are:

Slope Assemblage	Demersal Shelf Assemblage	Pelagic Shelf Assemblage
Aurora rockfish (*S. aurora*)	Canary Rockfish (*S. pinniger*)	Dusky rockfish *(S. variabilis)*
Blackgill rockfish (*S. melanostomus*)	China Rockfish (*S. nebulosus*)	Dark rockfish (*S. ciliatus*)
Boccacio (*S. paucispinus*)	Copper rockfish (*S. caurinus*)	Widow rockfish (*S. entomelas*)
Chilipepper rockfish (*S. goodei*)	Quillback rockfish (*S. maliger*)	Yellowtail rockfish (*S. flavidus*)
Darkblotch rockfish (*S. crameri*)	Redbanded rockfish (*S. babcocki*)	
Greenstriped rockfish (*S. elongatus*)	Rosethorn rockfish (*S. helvomaculatus*)	
Harlequin rockfish (*S. variegatus*)	Tiger Rockfish (*S. nigrocinctus*)	
Northern rockfish (*S. polyspinus*)	Yelloweye rockfish (*S. ruberrimus*)	
Pacific Ocean Perch (*S. alutus*)		
Pygmy rockfish (*S. wilsoni*)		
Redstripe rockfish (*S. proriger*)		
Rougheye rockfish (*S. aleutianus*)		
Sharpchin rockfish (*S. zacentrus*)		
Shortbelly rockfish (*S. jordani*)		
Shortraker rockfish (*S. borealis*)		
Silvergray rockfish (*S. brevispinus*)		
Splitnose rockfish (*S. diploproa*)		
Stripetail rockfish (*S. saxicola*)		
Vermilion rockfish (*S. miniatus*)		
Yellowmouth rockfish (*S. reedi*)		

The four most valuable slope species, Pacific ocean perch, shortraker, rougheye, and northern rockfish, have been managed separately from the remainder of the slope assemblage since the early 1990s, to prevent possible overfishing. A rebuilding plan was put into place in 1995 for Pacific ocean perch, to address population declines resulting in a biomass well below historical levels. The population has since increased in abundance and is now at a level above $B_{40\%}$.

Atka mackerel, a member of the greenling family (*Hexagrammidae*), supported a targeted foreign fishery in the Central regulatory area in the 1970s, but abundance of this species has declined to negligible quantities. The decreased abundance of Atka mackerel may be due to westward shift in the distribution of the stocks, to excessive fishing mortality, or to successive years of poor recruitment. Length frequency information suggests that the population consists mostly of large fish. The absence of catches in the Eastern and Central regulatory areas indicates stocks are not sufficiently abundant to support a commercial fishery, although small amounts are caught incidentally during other groundfish fishing activities.

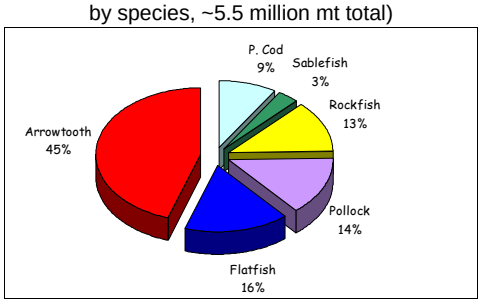
Along the slope of the continental shelf, grenadiers or rattails (*Coryphaenoides sp.*) are important components of the groundfish community, and are taken incidentally in the sablefish longline fisheries.

Elasmobranchs are represented in the GOA by several species of sharks and skates. Skates (*Rajidae*) are widely distributed throughout the GOA and are most abundant on the inner shelf. The spiny dogfish shark (*Squalus acanthias*), is much less abundant in the GOA than in waters off British Columbia and the Pacific Northwest where it is an important element within the groundfish community. Ratfish (*Hydrolagus collei*) are present in the GOA but are much less abundant there than in waters to the south. The abundance of all elasmobranchs appears to decrease progressing from east to west in the GOA toward the Alaska Peninsula.

4.1.2 Status of Stocks

The following sections summarize the status of the various groundfish stocks of commercial importance in the GOA, and of Pacific halibut. More detailed assessments and current estimates of biomass and acceptable biological catches can be found in the *Stock Assessment and Fishery Evaluation* (SAFE) report, that is produced annually (or biennially for some stocks) by the Gulf of Alaska Groundfish Plan Team (available at www.fakr.noaa.gov/npfmc). The information in this section comes from the November 2003 SAFE report (NPFMC 2003). The SAFE report contains further details on fishery statistics, resource assessment surveys, and the analytical techniques applied to the assessment of the various species. Status information for Pacific halibut, developed by the International Pacific Halibut Commission (IPHC), is also available in the SAFE report.

2004 Projected Biomass for GOA Groundfish, by species, ~5.5 million mt total)



4.1.2.1 Walleye Pollock

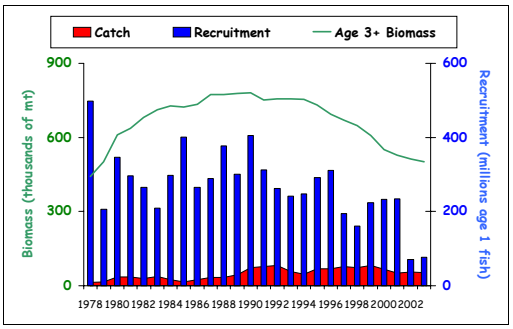
Pollock in the GOA are managed as a single stock that is separate from the Bering Sea and Aleutian Island pollock stocks. For 2004, exploitable biomass (age 3+) in the entire GOA is projected at 769,420 mt, an increase from 2003. The 2004 acceptable biological catch (ABC) is set at 71,260 mt (includes Western/Central and Eastern GOA ABCs). Biomass has declined since the mid 1980s. The 1994 and 1999 year-classes were above average, and have contributed to recent fisheries.

Projected biomass and ABC (mt) of GOA walleye pollock.

Year	Biomass	ABC
2002	755,310	58,250
2003	727,830	54,350
2004	769,420	71,260

In 1990, roe-stripping of pollock was prohibited. In 1993, the Council apportioned 100 percent of GOA pollock to the inshore sector. Since 1992, the pollock total allowable catch (TAC) has been apportioned seasonally and spatially to protect Steller sea lions. In December 1998, NMFS issued a biological opinion that the pollock fishery jeopardized the continued existence or adversely modified the critical habitat of Steller sea lions. In response, the Council prohibited pollock fishing within 10-20 nautical miles of numerous rookeries and haulouts, reduced the catch of pollock within critical habitat areas, and distributed fishing effort. Beginning in 1998, 100 percent retention is required for pollock under the improved retention/improved utilization (IR/IU) program.

Pacific Cod Abundance and Recruitment Trends



4.1.2.2 Pacific Cod

The Pacific cod stock in the GOA has also declined since peaking in the late 1980s. The 2004 exploitable biomass (age 3+) was projected to be 484,000 mt. The 2004 ABC is 62,810

mt. The absolute biomass increased in 2004 compared to recent declines.

The Pacific cod stock is exploited by a multiple-gear fishery, principally by trawls and smaller amounts by longlines, jigs, and pots. For trawl fisheries in the exclusive economic zone (EEZ), cod harvests have been constrained by halibut bycatch limits. A state water fishery for pot and jig gear began in 1997, and guideline harvest levels (GHLs) have since been set at between 10 percent and 25 percent of the federal GOA quota in each regulatory area. The state GHLs are not allowed to exceed 25 percent of the total federal quota.

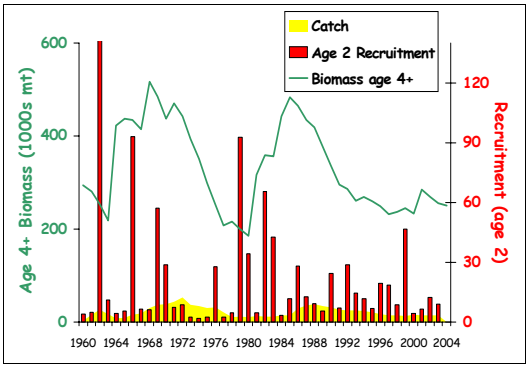
Projected biomass and ABC (mt) of GOA Pacific cod.

Year	Biomass	ABC
2002	468,000	57,600
2003	428,000	52,800
2004	484,000	62,810

In 1993, the Council apportioned 90 percent of GOA Pacific cod TAC to the inshore sector and 10 percent to the offshore sector. Beginning in 1998, the IR/IU program was implemented, requiring full retention of all Pacific cod caught.

4.1.2.3 Sablefish

Alaska Sablefish Abundance and Recruitment Trends



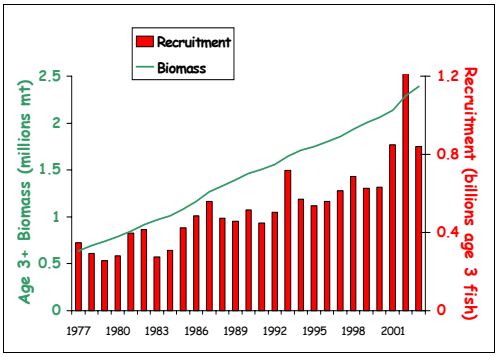
Sablefish in the Bering Sea, Aleutian Islands, and GOA are considered to be of one stock. The resource is managed by region in order to distribute exploitation throughout the range of the stock. Large catches of sablefish (up to 26,000 mt) were made in the Bering Sea during the 1960s, but have since declined in that area. Catch in the GOA peaked in 1972 at 36,776 mt, and rose again in the late 1980s. The projected 2004 exploitable biomass is 179,000 mt in the GOA, with an ABC of 16,550 mt. Biomass of the sablefish stock off Alaska appears low and stable.

Projected biomass and ABC (mt) of GOA sablefish.

Year	Biomass	ABC
2002	188,000	12,820
2003	182,000	14,890
2004	179,000	16,550

The TAC for sablefish is apportioned among gear types. Sablefish in the Western and Central GOA is allocated 80 percent to hook-and-line gear and 20 percent to trawl gear. In the Eastern GOA, the sablefish TAC is allocated 95 percent to hook-and-line gear and 5 percent to trawl gear. Longlined pots are not a legal gear type for sablefish in the GOA. The fixed gear apportionment of the sablefish TAC is managed under an individual fishing quota (IFQ) program, which began in 1995. Twenty percent of the fixed gear allocation is reserved for use by community development quota (CDQ) participants. Important state water sablefish fisheries occur in Chatham Strait, Clarence Strait, Prince William Sound, and the Aleutian Islands.

Arrowtooth Flounder Abundance and Recruitment Trends



4.1.2.4 Flatfish

The flatfish assemblage has been divided into several categories for management purposes. Catch limits for flatfish are specified separately for the

Projected biomass and ABC (mt) of GOA flatfish, 2004.

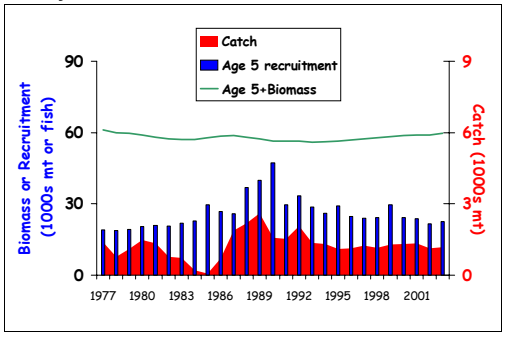
Species	Biomass	ABC
deep water flatfish	99,620	6,070
rex sole	99,950	12,650
shallow water flatfish	375,950	52,070
flathead sole	292,670	51,720
arrowtooth flounder	2,453,390	194,930

deep water flatfish complex (Dover sole, Greenland turbot, and deep-sea sole), rex sole, the shallow water flatfish complex (rock sole, yellowfin sole, Alaska plaice, and other flatfish), flathead sole, and arrowtooth flounder. Projected biomass and ABC estimations for 2004 are provided for the flatfish assemblage in the adjacent table.

Far and away the dominant flatfish species in the GOA is arrowtooth flounder. Arrowtooth flounder biomass in the GOA appears to be at peak levels. Recent trophic studies have suggested that they are an important component in the dynamics of the GOA benthic ecosystem. The resource is lightly exploited as it is presently of limited economic importance, although research has been conducted on their commercial utilization. Retention rates have increased steadily since the early 1990s.

4.1.2.5 Rockfish

Thornyhead Rockfish Abundance and Recruitment Trends



Sebastes and *Sebastolobus* rockfish are found in the GOA. In 1979, thornyhead rockfish (genus *Sebastolobus*) were assigned to an independent management category.

Thornyhead rockfish – The thornyhead rockfish assemblage consists of two species: shortspine and longspine thornyheads. The species are abundant throughout the GOA and are commonly taken by bottom trawls and longline gear. Recent harvests have been between 50-70 percent of the ABC. Due to the long-lived nature of this species, the overall harvest rate recommendation is low at about 2 percent of the total age 5+ biomass.

Projected biomass and ABC (mt) of GOA thornyhead rockfish.

Year	Biomass	ABC
2002	77,840	1,990
2003	75,896	2,000
2004	86,200	1,940

At least 32 rockfish species of the genus *Sebastes* occur in the GOA. Since 1988, these rockfish have been divided into three management assemblages based on their habitat and distribution: slope, pelagic shelf, and demersal shelf rockfish.

***Sebastes* rockfish assemblages in the GOA.**

Slope rockfish	Pelagic shelf rockfish	Demersal shelf rockfish
Pacific ocean perch	dusky	canary
shortraker/rougheye	widow	china
northern	yellowtail	copper
other rockfish (harlequin, sharpchin, redstripe, many others)		quillback
		rosethorn
		tiger
		yelloweye

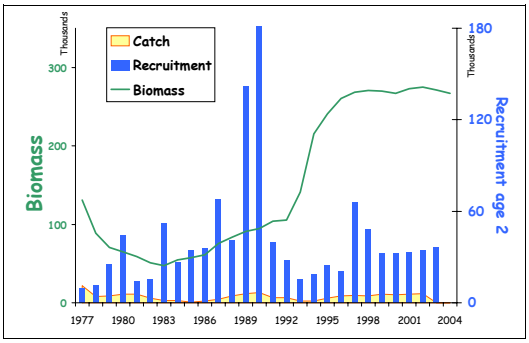
In 1998, a prohibition on trawling in the part of the Eastern GOA regulatory area, east of 140° W. longitude affected *Sebastes* rockfish fisheries, which are primarily conducted with trawl gear. To prevent over-concentration of harvest, the Eastern GOA TACs have since been apportioned by district, between West Yakutat and East Yakutat/Southeast Outside, for some species. Summary information for the slope, pelagic shelf, and demersal shelf rockfish assemblages is provided below.

Slope rockfish - In the early 1990s, the slope assemblage was divided into four management subgroups: Pacific ocean perch (POP), shortraker/rougheye rockfish, northern rockfish, and all other species of slope rockfish, in order to protect the most sought-after species in the assemblage from possible overfishing. The primary commercial rockfish species in the GOA is POP. A plan for rebuilding POP was implemented in 1995 after the population declines resulted in a biomass level at well below historical levels. Relatively strong recent year-classes appear to have contributed to increased abundance, and the spawning stock now exceeds the $B_{40\%}$ level. The majority of the exploitable biomass of the northern rockfish is located in the Central GOA. Gulf-wide catch has ranged from 2,947 mt to 5,760 over the last ten years, with annual ABCs and TACs remaining fairly constant (between 4,880 mt and 5,760 mt) over the same period. Shortraker and rougheye rockfish inhabit a narrow band along the upper continental slope at depths of 300-500 m, and often co-occur in trawl or longline hauls. They are similar in appearance and can be difficult to distinguish visually, which is why they are grouped together as a management category. With the exception of harlequin rockfish, the 17 species that comprise the "other slope" rockfish assemblage are at the northern edge of their ranges, and are most abundant in the eastern GOA. Actual catch is considerably less than the ABC, particularly since the 1998 trawl closure east of 140° W. longitude.

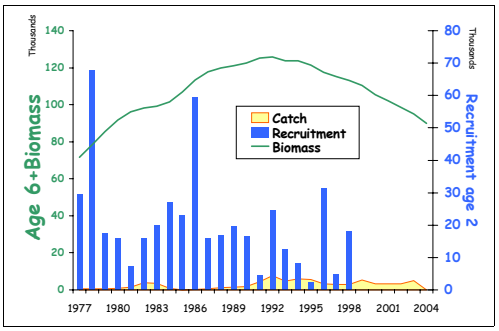
Projected biomass and ABC (mt) of GOA slope rockfish, 2004.

Species	Biomass	ABC
Pacific ocean perch	299,960	13,340
shortraker/rougheye	73,000	1,318
northern	95,150	4,870
other slope	89,460	3,900

Pacific Ocean Perch Abundance and Recruitment Trends



Northern Rockfish Abundance and Recruitment Trends



Pelagic shelf rockfish - The pelagic shelf rockfish assemblage in the GOA includes those rockfish on the continental shelf that typically exhibit a midwater, schooling behavior. In 1998, black rockfish and blue rockfish were removed from federal management as part of the pelagic shelf complex, and are now managed by the State of Alaska. A proposal is in preparation to remove dark rockfish to State management also.

Projected biomass and ABC (mt) of GOA pelagic shelf rockfish.

Year	Biomass	ABC
2002	62,489	5,490
2003	62,489	5,490
2004	62,500	4,470

Demersal shelf rockfish - The demersal shelf rockfish (DSR) assemblage is comprised of seven species of shallow, nearshore, bottom-dwelling rockfishes. Yelloweye rockfish accounts for 90 percent of all DSR landings. ABC recommendations for the entire assemblage are keyed to adult yelloweye abundance. Since 1991, the DSR assemblage has been managed by the State of Alaska under Council oversight, although the harvest level is still set by the Council and NMFS. DSR were excluded from the Council license limitation program because Alaska Department of Fish and Game (ADF&G) planned to initiate an analysis for a separate DSR license limitation program. As of 2004, full retention of all DSR caught off Southeast Alaska is required.

Projected biomass and ABC (mt) of GOA demersal shelf rockfish.

Year	Biomass	ABC
2002	15,615	350
2003	17,510	390
2004	20,168	450

4.1.2.6 Pacific Halibut Stock

Large year-classes produced in the late 1970s and into the mid-1980s resulted in a buildup of halibut biomass to current high levels. The 2000 total exploitable biomass was projected to be 395.7 million pounds. Over half of the biomass is found in areas 3A and 3B (central and western GOA). Recruitment of 8 year-olds appears to have fallen off after a strong 1987 year-class recruited in 1995.

The directed halibut longline fishery is prosecuted under the halibut/ sablefish individual fishing quota (IFQ) program, which began in 1995. The Pacific halibut stock is managed by the International Pacific Halibut Commission (IPHC), which sets the annual catch specifications for halibut off the coasts of California, Oregon, Washington, Canada, and Alaska. Alaska's IFQ allocations increased in Areas 2C and 3A in 2004 (corresponding to the eastern and central GOA), and were reduced in the western GOA and BSAI compared to 2003.

Pacific halibut exploitable biomass, annual commercial allocation, and actual commercial catch (in millions of pounds) in Alaska.

Year	Exploitable biomass	Allocation	Catch
2001	481.3	61.5	58.6
2002	528.6	61.9	60.6
2003	580.9	61.9	59.6
2004	357.0	61.2	na

During the years 2001 to 2004, 70-85 percent of the Alaskan halibut biomass occurred in the GOA.

Limits are placed on halibut taken as bycatch in groundfish target fisheries. These limits are expressed in terms of halibut mortality, and discarded halibut mortality rates are set in regulation. The limits for the BSAI and the GOA are listed in the adjacent table.

Prohibited species catch limits (mt) for halibut mortality in the GOA and non-CDQ BSAI fisheries, 2001-2004.

Region	Trawl	Fixed gear
BSAI	3,400	833
GOA	2,000	300

4.2 Habitat

The following sections describe the habitat of the GOA management area, define essential fish habitat for each of the managed species, describe habitat areas of particular concern, and provide habitat conservation and enhancement recommendations.

4.2.1 Habitat Types

Marine habitats within the GOA include estuaries, tideland marshes, bays, fjords, sandy beaches, unprotected rocky shores, river deltas, and a variety of continental shelf, slope, seamounts, and deep ocean habitats. This section describes the physical environment of the GOA. More detailed information can be found in Morris *et al.* (1983), Sharma (1979), and Hood and Zimmerman (1986).

The GOA is a large body of water bordered by the Alaska coast from Dixon Entrance to Unimak Pass. This coast is unusually rugged and mountainous and deeply indented by numerous fjords and inlets. Tidewater glaciers flow down into the heads of many bays. Thousands of streams and rivers flow into these waters, including many that are glacier-fed and silt-laden.

The continental shelf parallels the southeastern Alaska coast and extends around the GOA (Figure 4-1). Total area of the continental shelf in the GOA is about 160,000 square km. Between Canada and Cape Spencer in the GOA, the continental shelf is narrow and rough. North and west of Cape Spencer it is broader and more suitable for trawling. As it curves westerly from Cape Spencer towards Kodiak Island it extends some 50 miles seaward, making it the most extensive shelf area south of the Bering Sea. West of Kodiak Island and proceeding along the Alaska Peninsula toward the Aleutian Islands, the shelf gradually becomes narrow and

rough again. Although its width is less than 10 miles at some points, it is generally 30 to 60 miles wide. Off the Kenai Peninsula and Kodiak Island it is more than 100 miles broad.

The continental shelf reflects the rugged coastline; it is irregular and frequently interrupted by submarine valleys. These deepwater valleys, or troughs, separate broad bank areas such as Albatross and Portlock Banks near Kodiak Island and Davidson Bank south of Unimak Island. In the western GOA, these submarine banks are generally covered with sand and gravel, indicating a vigorous current flow in the overlying water. In contrast, the sea valleys adjacent to these banks are usually sediment-laden. Rock out-croppings occasionally occur along the edge of these banks and where the continental shelf meets the deeper water of the slope. A pronounced feature of the western portion of the GOA is a greater frequency and expansiveness of plateau-like banks and offshore islands than in the eastern part.

The continental shelf extends from the coast seaward to depths of approximately 200 m. At its edge, bottom depths increase rapidly toward the ocean basin or abyssal plain of the GOA. This region of rapidly increasing depth is known as the continental slope, which can be subdivided into an upper slope from 200 to 500 m in depth and a lower slope greater than 500 m. The 2,000 m depth line can be considered the boundary between the continental slope and the abyssal plain. In general, bottom sediment becomes finer with increasing depth so that in the lower slope and abyssal plain the sediment consists mainly of a mixture of clay and silt. The abyssal plain of the GOA contains submarine mountains that rise thousands of meters from the ocean floor. These seamounts, or guyots, are remnants of extinct volcanoes whose peaks have been eroded away to form flat-topped features.

Coastal waters overlying the continental shelf are subject to considerable seasonal influences. Winter cooling accompanied by turbulence and mixing due to major storms results in a uniform cold temperature in the upper 100 m.

Seaward of the continental shelf, there is a surface flow of water called the Alaska Current which moves in a northwesterly direction in the eastern GOA and swings to the west and southwest off Kodiak Island and westward toward Unimak Pass (Musgrave *et al.* 1992). Its rate of flow varies by season and is highest during the winter where, off Kodiak Island, its speed may exceed one knot. There is also evidence of an interannual eddy off the coast of southeast Alaska named the Sitka Eddy. This is a large (300 km in diameter) clockwise-rotating vortex that is observed in some years centered near 57° N. latitude, 138° W. longitude. Currents in the eddy can exceed one knot and could affect distribution of fish and larvae (Hamilton and Mysak 1985, Tabata 1982).

Seasonal changes in temperature and salinity diminish with increasing depth and distance from shore. Along the outer shelf and upper slope, bottom water temperatures of 4 to 5° C persist year-round throughout the periphery of the GOA. With further increase in depth, water temperature shows no significant seasonal change but gradually decreases with depth, reaching 2° C or less at greater depths.

Most of the commercial fisheries on pelagic and demersal fishes take place in the habitats of the shelf and upper slope. Longline fisheries for sablefish extend deeper into the lower slope habitat to about 1,200 m. No fisheries take place in the abyssal plain where commercial quantities of fishery resources are believed to be lacking. Fisheries of limited duration have taken place on selected seamounts.

Associated with seasonal temperature changes in the bottom water of the shelf habitat are bathymetric shifts in the distribution of many demersal fish and shellfish populations from shallow to deeper water during the winter cooling period and the reverse movement to shallower water during the summer warming period.

Figure 4-1 Bathymetric map of the Gulf of Alaska.

4.2.2 Essential Fish Habitat Definitions

For each groundfish species, the amount of information available on the distribution of a life stage is indicated by the level to which it is classified (Table 4-1). A summary of the habitat information levels for each species is listed in Table 4-2. A detailed description of life history features and habitat requirements of FMP species is contained in Appendix D. Appendix E includes the maps of EFH for the species described in this section.

Table 4-1 Classification of EFH levels

Level 0	No systematic sampling has been conducted for this species and life stage; may have been caught opportunistically in small numbers during other research.
Level 0_a	Some information on a species' life stage upon which to infer general distribution.
Level 0_b	No information on the life stage, but some information on a similar species or adjacent life stage from which to infer general distribution.
Level 0_c	No information on the actual species' life stage and no information on a similar species or adjacent life stages, or where complexity of a species stock structure prohibited inference of general distribution.
Level 1	Distribution data are available for some or all portions of the geographic range of the species.
Level 2	Habitat-related densities of the species are available
Level 3	Growth, reproduction, or survival rates within habitats are available
Level 4	Production rates by habitat are available

Table 4-2 Levels of essential fish habitat information currently available for GOA groundfish, by life history stage. Juveniles were subdivided into early and late juvenile stages based on survey selectivity curves.

Species	Eggs	Larvae	Early Juveniles	Late Juveniles	Adults
Pollock	1	1	1	1	2
Pacific cod	0_a	0_a	0_a	1	2
Sablefish	0_a	0_a	0_a	1	2
Shallow water flatfish					
Yellowfin sole	0_a	0_a	0_a	1	2
Rock sole	0_a	0_a	0_a	1	2
Deep water flatfish	0_a	0_a	0_a	0_a	1
Rex sole	0_a	0_a	0_a	0_a	1
Flathead sole	0_a	0_a	0_a	1	2
Arrowtooth flounder	0_a	0_a	0_a	1	2
Pacific ocean perch	-	0_a	0_a	1	1
Northern rockfish	-	0_b	0_b	1	1
Shortraker rockfish	-	0_b	0_{a-b}	0_b	1
Rougheye rockfish	-	0_b	0_{a-b}	1	1
Pelagic shelf rockfish					
Dusky rockfish	-	0_b	0_b	0_a	1
Demersal shelf rockfish					
Yelloweye rockfish	-	0_b	0_a	1	1
Thornyhead rockfish	0_a	0_a	0_a	0_a	1
Atka mackerel	0_a	0_a	0_b	0_b	1
Skates	0_a	-	0_a	0_a	1
Other species					
squid	0_a	-	0_a	0_a	0_a
sculpins	0_a	0_a	0_a	0_a	1
sharks	-	-	0_a	0_a	0_a
octopus	0_a	-	0_a	0_a	0_a
Forage fish species					
eulachon and capelin	0_a	0_a	0_a	0_a	0_a
myctophids and bathylagids	0_c	0_c	0_a	0_a	0_a
sand lance	0_a	0_a	0_a	0_a	0_a
sand fish	0_a	0_c	0_a	0_a	0_a
pholids and stichaeids	0_c	0_c	0_a	0_a	0_a
gonostomatids	0_c	0_c	0_c	0_c	0_a
euphausiids	0_a	0_a	0_a	0_a	0_a

NOTE: "-" indicates a species that has internal fertilization and bears live young.

4.2.2.1 Walleye Pollock

Eggs (duration 14-25 days) - Level 1: Pelagic waters of the outer continental shelf and upper slope of the GOA from Dixon Entrance to 170° W. longitude. Spawning concentrations occur in Shelikof Strait (late March), in the Shumagin Islands (early March), the east side of Kodiak Island and near Prince William Sound. Oceanographic features that eggs may be associated with are gyres.

Larvae (duration 60 days) - Level 1: Epipelagic waters of the water column along the middle and outer continental shelf in the GOA from Dixon Entrance to 170° W. longitude. Feeding areas are those that contain copepod, naupli and small euphausiids. Oceanographic features that larvae may be associated with are gyres and fronts.

Juveniles (up to 4 years) - Level 1: Pelagic waters along the inner, mid and outer continental shelf in the GOA from Dixon Entrance to 170° W. longitude. Feeding areas are those that contain pelagic crustaceans, copepods and euphausiids. Oceanographic features that juveniles may be associated with are fronts and the thermocline.

Adults (4+ years old) - Level 2: Pelagic waters from 70-200 m along the outer continental shelf and basin in the GOA from Dixon Entrance to 170° W. longitude. Feeding areas are those that contain pelagic crustaceans and fish. Oceanographic features that adults are associated with are fronts and upwelling. Spawning concentrations occur in Shelikof Strait, in the Shumagin Islands, the east side of Kodiak Island and near Prince William Sound in late winter. Area in GOA where greatest abundance occurs are between 147° W. to 170° W. longitude at depths less than 300 m.

4.2.2.2 Pacific Cod

Eggs (duration 15-20 days) - Level 0_a: Areas of mud and sand on the inner, middle, and outer continental shelf and upper slope throughout the GOA from Dixon Entrance to 170° W. longitude in winter and spring.

Larvae (duration unknown) - Level 0_a: Epipelagic waters throughout the GOA from Dixon Entrance to 170° W. longitude in winter and spring.

Early Juveniles (up to 2 years) - Level 0_a: Areas of mud, sandy mud, muddy sand, and sand along the inner and middle continental shelf and the lower portion of the water column of the GOA from Dixon Entrance to 170° W. longitude. Feeding areas contain small invertebrates(e.g., mysids, euphausiids, and shrimp).

Late Juveniles (2-5 years) - Level 1: Areas of mud, sandy mud, muddy sand, and sand along the inner and middle continental shelf and the lower portion of the water column of the GOA from Dixon Entrance to 170° W. longitude. Feeding areas contain pollock, flatfish, and crab.

Adults (5+ years old) - Level 2: Areas of mud, sandy mud, muddy sand, and sand along the inner and middle continental shelf and the lower portion of the water column of the GOA from Dixon Entrance to 170° W. longitude. Feeding areas contain pollock, flatfish, and crab. Spawning occurs in January-May.

4.2.2.3 Sablefish

Eggs (duration 14-20 days) - Level 0_a: Pelagic waters of the continental shelf and basin areas from 200-3000 m extending to the seaward boundaries of the EEZ of the GOA from Dixon Entrance to 170° W. longitude from late winter to early spring (December-April).

Larvae (duration up to 3 months) - Level 0_a: Epipelagic waters of the middle and outer continental shelf, the slope and basin areas in the GOA from Dixon Entrance to 170° W. longitude during late spring-early summer months (April-July).

Early Juveniles (up to 2 years) - Level 0_a: Pelagic waters, during first summer, along the outer, middle, and inner continental shelf of the GOA from Dixon Entrance to 170° W. longitude. Areas of soft-bottom in nearshore bays and island passes after the first summer until end of second summer.

Late Juveniles (2-5 years) - Level 1: Areas of soft bottom deeper than 100 m associated with the continental slope and deep shelf gulleys and fjords (presumably within the lower portion of the water column) of the GOA from Dixon Entrance to 170° W. longitude. Feeding areas contain mesopelagic and benthic fishes, benthic invertebrates, and jellyfish.

Adults (5+years) - Level 2: Areas of soft bottom deeper than 200 m (presumably within the lower portion of the water column) associated with the continental slope and deep shelf gulleys and fjords (such as Prince William Sound and those in southeastern Alaska) of the GOA from Dixon Entrance to 170° W. longitude. Feeding areas contain mesopelagic and benthic fishes, benthic invertebrates and jellyfish. A large portion of the adult diet is comprised of gadid fishes, mainly pollock.

4.2.2.4 Shallow-water Flatfish Complex

Yellowfin sole

Eggs (duration unknown) - Level 0_a: Pelagic inshore waters of the central and western GOA during summer months.

Larvae (duration 2-3 months) - Level 0_a: Pelagic inshore waters and inner continental shelf regions of the central and western GOA during summer and autumn months.

Early Juveniles (to 5.5 years old) - Level 0_a: Demersal areas (bottom and lower portion of the water column) on the inner, middle and outer portions of the continental shelf (down to 250 m) and within nearshore bays of the central and western GOA.

Late Juveniles (5.5-9 years old) - Level 1: Areas of sandy bottom along with the lower portion of the water column within nearshore bays and on the inner, middle and outer portions of the continental shelf (down to 250 m) of the central and western GOA. Feeding areas would be those containing polychaetes, bivalves, amphipods and echiurids.

Adults (9+ years old) - Level 2: Areas of sandy bottom along with the lower portion of the water column on the inner, middle and outer portions of the continental shelf (down to 250 m) of the central and western GOA. Areas of known concentrations vary seasonally. Adult spawning areas known for the Bering Sea. Summer (June-October) feeding concentrations of adults known in the Bering Sea. Feeding areas would be those containing polychaetes, bivalves, amphipods and echiurids. In winter, yellowfin sole adults migrate to deeper waters of the shelf (100-200 m) south of 60° N. latitude to the Alaskan Peninsula.

Rock sole

Eggs (duration unknown) - Level 0_a: Areas of pebbles and sand at depths of 125-250m in winter (December-March) along the shelf-slope break in the of Alaska from Dixon Entrance to 170° W. longitude.

Larvae (duration 2-3 months) - Level 0_a: Pelagic waters of the of Alaska from Dixon Entrance to 170° W. longitude over the inner, middle and outer continental shelf and slope.

Early Juveniles (to 3.5 years old) - Level 0_a: Inner, middle and outer portions of the continental shelf (down to 250m) of the GOA and the lower portion of the water column from Dixon Entrance to 170° W. longitude. Feeding areas would be those containing polychaetes, bivalves, amphipods and crustaceans.

Late Juveniles (3.5-8 years old) - Level 1: Areas of pebbles and sand along with the lower portion of the water column within nearshore bays and on the inner, middle and outer portions of the continental shelf (down to 250 m) of the of Alaska from Dixon Entrance to 170° W. longitude. Feeding areas would be those containing polychaetes, bivalves, amphipods and crustaceans.

Adults (8+ years old) - Level 2: Areas of pebbles and sand along with the lower portion of the water column on the inner, middle and outer portions of the continental shelf (down to 250 m) of the of Alaska from Dixon Entrance to 170° W. longitude. Areas of known concentrations vary seasonally and include adult spawning areas in winter and feeding areas in summer (May-October) in the Bering Sea. Feeding areas would be those containing polychaetes, bivalves, amphipods and crustaceans.

4.2.2.5 Deep-water Flatfish Complex

Dover sole

Eggs (duration unknown) - Level 0_a: Pelagic waters along the inner, middle and outer continental shelf, during spring and summer, of the GOA from Dixon Entrance to 170° W. longitude.

Larvae (up to 2 years) - Level 0_a: Pelagic waters along the inner, middle, and outer continental shelf and upper slope of the GOA from Dixon Entrance to 170° W. longitude.

Early Juveniles (up to 3 years) - Level 0_a: Areas of sand and mud along the inner and middle continental slope and the lower portion of the water column of the GOA from Dixon Entrance to 170° W. longitude. Feeding areas contain polychaetes, amphipods and annelids.

Late Juveniles (3-5 years old) - Level 0_a: Areas of sand and mud along the inner and middle continental slope and the lower portion of the water column of the GOA from Dixon Entrance to 170° W. longitude. Feeding areas contain polychaetes, amphipods and annelids.

Adults (5+ years old) - Level 1: Areas of sand and mud along the middle to outer continental shelf and upper slope deeper than 300 m and the lower portion of the water column of the GOA from Dixon Entrance to 170° W. longitude. Winter and spring spawning and summer feeding on soft substrates (sand and mud) of the continental shelf and upper slope and a shallower summer distribution mainly on the middle to outer portion of the shelf and upper slope. Feeding areas contain polychaetes, amphipods, annelids and mollusks.

4.2.2.6 Rex Sole

Eggs - Level 0_a: Pelagic waters of the inner, middle, and outer continental shelf of the GOA from Dixon Entrance to 170° W. longitude during the months between February and July.

Larvae - Level 0_a: Pelagic waters of the inner, middle, and outer continental shelf of the GOA from Dixon Entrance to 170° W. longitude during the spring and summer months.

Juveniles (up to 2 years) - Level 0_a: Areas of gravel, sand, and mud along the inner, middle to outer continental shelf deeper than 300 m, and the lower portion of the water column, of the GOA from Dixon Entrance to 170° W. longitude. Feeding areas contain polychaetes, amphipods, euphausiids and Tanner crab.

Adults (2+ years) - Level 1: Areas of gravel, sand and mud along the inner, middle to outer continental shelf deeper than 300 m, and the lower portion of the water column, of the GOA from Dixon Entrance to 170° W.

longitude. Feeding areas contain polychaetes, amphipods, euphausiids and Tanner crab. Spawning occurs from February through July along areas of sand, mud, and gravel substrates of the continental shelf.

4.2.2.7 Flathead Sole

Eggs (duration unknown) - Level 0_a: Pelagic waters (January-April) along the inner, middle, and outer continental shelf of the GOA from Dixon Entrance to 170° W. longitude.

Larvae (duration unknown) - Level 0_a: Pelagic waters along the inner, middle, and outer continental shelf in the GOA from Dixon Entrance to 170° W. longitude. Feeding areas contain phytoplankton and zooplankton.

Early Juveniles (up to 2 years) - Level 0_a: Areas of sand and mud along the inner, middle and outer continental shelf and upper slope and the lower portion of the water column in the GOA from Dixon Entrance to 170° W. longitude. Feeding areas contain polychaetes, bivalves, ophiuroids, pollock and small tanner crab.

Late Juveniles (2-3 years old) - Level 1: Areas of sand and mud along the inner, middle and outer continental shelf and upper slope and the lower portion of the water column in the GOA from Dixon Entrance to 170° W. longitude. Feeding areas contain polychaetes, bivalves, ophiuroids, pollock, and small tanner crab.

Adults (3+ years old) - Level 2: Areas of sand and mud along the inner, middle and outer continental shelf and upper slope and the lower portion of the water column in the GOA from Dixon Entrance to 170° W. longitude. Feeding areas, primarily on the inner, middle, and outer shelf in spring, summer, and fall, contain polychaetes, bivalves, ophiuroids, pollock, small tanner crab and other crustaceans. Spawning areas in winter and early spring are located primarily on the outer shelf.

4.2.2.8 Arrowtooth Flounder

Eggs (duration unknown) - Level 0_a: Pelagic waters (November-March) along the inner, middle, and outer continental shelf GOA from Dixon Entrance to 170° W. longitude.

Larvae (duration 2-3 months) - Level 0_a: Pelagic waters along the inner and outer continental shelf and nearshore bays during the spring and summer in the GOA from Dixon Entrance to 170° W. longitude. Feeding areas are those that contain phytoplankton and zooplankton.

Early Juveniles (to 2 years old) - Level 0_a: Areas of gravel, sand, and mud and the associated water column of the inner continental shelf and the adjacent nearshore bays in the GOA from Dixon Entrance to 170° W. longitude.

Late Juveniles (2-4 years old) - Level 1: Areas of gravel, sand and mud along the inner, middle, and other continental shelf and upper slope and the lower portion of the water column in the GOA from Dixon Entrance to 170° W. longitude. Feeding areas contain euphausiids, crustaceans, amphipods, and pollock.

Adults (4+ years old) - Level 2: Areas of gravel, sand and mud along the inner, middle, and other continental shelf and upper slope and the lower portion of the water column in the GOA from Dixon Entrance to 170° W. longitude. Summer feeding areas on the middle and outer shelf contain gadids, euphausiids, and other fish. Spawning areas in winter are on the outer shelf and upper slope regions.

4.2.2.9 Pacific Ocean Perch and "Other Slope" Rockfish

Eggs (internal incubation, ~90days) - no EFH definition determined: Internal fertilization and incubation. Incubation is assumed to occur during the winter months.

Larvae (duration 60-180 days) - Level 0_a: Pelagic waters of the inner, middle, and outer continental shelf, the upper and lower slope and the basin areas of the EEZ of the GOA from Dixon Entrance to 170° W. longitude, during the spring and summer months.

Early Juveniles (larval stage to 3 years) - Level 0_a: Initially pelagic, then demersal in very rocky areas of the inner continental shelf of the GOA from Dixon Entrance to 170° W. longitude.

Late Juveniles (3-10 years) - Level 1: Areas of cobble, gravel, mud, sandy mud, and muddy sand along the inner, middle, and outer continental shelf and upper slope areas, shallower than adults, middle to lower portions of the water column, of the GOA from Dixon Entrance to 170° W. longitude. Feeding areas contain euphausiids.

Adults (10+ years) - Level 1: Areas of cobble, gravel, mud, sandy mud and muddy sand along the outer continental shelf and upper slope areas from 180-420m (actual depths sampled) of the GOA from Dixon Entrance to 170° W. longitude. Feeding areas contain euphausiids. Areas of high concentrations tend to vary seasonally and may be related to spawning behavior. In summer, adults inhabit shallower depths (180-250m) and in the fall they migrate farther offshore (300-420m).

4.2.2.10 Northern Rockfish

Eggs - no EFH definition determined: Internal fertilization and incubation.

Larvae - Level 0_b: Pelagic waters of the inner, middle, and outer continental shelf, the upper and lower slope and the basin areas extending to the seaward boundary of the EEZ of the GOA from Dixon Entrance to 170° W. longitude, during the spring and summer months.

Early juveniles (up to 25cm) - Level 0_b: Pelagic waters and substrate of the inner, middle, and outer continental shelf of the GOA from Dixon Entrance to 170° W. longitude.

Late Juveniles (greater than 25 cm) - Level 1: Areas of cobble and rock along the shallower regions (relative to adults) of the outer continental shelf of the GOA from Dixon Entrance to 170° W. longitude.

Adults (13+years) - Level 1: Areas of cobble and rock along the outer continental slope and upper slope regions and the middle and lower portions of the water column of the GOA from Dixon Entrance to 170° W. longitude. Areas of relatively shallow banks of the outer continental shelf have been found to have concentrated populations.

4.2.2.11 Shortraker and Rougheye Rockfish

Eggs - no EFH definition determined: Internal fertilization and incubation.

Larvae (duration unknown) - Level 0_b: Pelagic waters of the inner, middle, and outer continental shelf, the upper and lower slope and the basin areas extending to the seaward boundary of the EEZ of the GOA from Dixon Entrance to 170° W. longitude, during the spring and summer months.

Early Juveniles (up to 20 cm)- Level 0_{a-b}: Between nearshore waters and outer continental shelf of the GOA from Dixon Entrance to 170° W. longitude.

Late Juveniles (greater than 20 cm) - Level 0_b and Level 1: Areas shallower than adult along the continental shelf of the GOA (includes substrate and water column) from Dixon Entrance to 170° W. longitude. Juvenile shortraker rockfish have been observed on only a few rare occasions. Presence presumed somewhere between nearshore and outer continental shelf between Dixon Entrance to 170° W. longitude.

Adults (15+ years) - Level 1: Areas of mud, sand, rock, sandy mud, cobble, muddy sand, and gravel at depths ranging from 200-500 m and the lower portion of the water column on the outer continental shelf and upper slope of the GOA from Dixon Entrance to 170° W. longitude. Fishery concentrations at 300-500 m. Feeding areas would be those areas where shrimps, squid and myctophids.

4.2.2.12 Pelagic Shelf Rockfish

Dusky rockfish

Eggs - no EFH definition determined: Internal fertilization and incubation.

Larvae - Level 0_b: Pelagic waters of the inner, middle, and outer continental shelf, the upper and lower slope and the basin areas extending to the seaward boundary of the EEZ of the GOA from Dixon Entrance to 170° W. longitude, during the spring and summer months.

Early juveniles (less than 25cm) - Level 0_b: Pelagic waters of the inner, middle, and outer continental shelf of the GOA from Dixon Entrance to 170° W. longitude.

Late Juveniles (greater than 25cm) - Level 0_a: Areas of cobble, rock, and gravel along the inner, middle, and outer continental shelf of the GOA from Dixon Entrance to 170° W. longitude. Location in water column is currently unknown.

Adults (up to 50 years) - Level 1: Areas of cobble, rock, and gravel along the outer continental shelf and upper slope region and the middle to lower portions of the water column of the GOA from Dixon Entrance to 170° W. longitude. Feeding areas contain euphausiids. Also found in nearshore waters of Southeast Alaska along rocky shores at depths less than 50 m.

4.2.2.13 Demersal Shelf Rockfish

Yelloweye rockfish

Eggs - no EFH definition determined: Internal fertilization and incubation.

Larvae (< 6 months) - Level 0_b: Epipelagic areas of the water column of the GOA from Dixon Entrance to 170° W. longitude during the spring and summer months.

Early Juveniles (to 10years) - Level 0_a: Areas of rock and coral along the inner, middle and outer continental shelf, bays and island passages and the entire water column of the GOA from Dixon Entrance to 170° W. longitude. Concentrations of young juveniles (2.5-10 cm) have been observed in areas of high relief (such as vertical walls, cloud sponges, fjord-like areas).

Late Juveniles (10-18 years) - Level 1: Areas of rock and coral along the inner, middle and outer continental shelf, nearshore bays and island passages of the GOA from Dixon Entrance to 170° W. longitude and the lower portion of the water column. High concentrations are found associated with high relief with refuge spaces such as overhangs, crevices and caves.

Adults (18+ years) - Level 1: Areas of rock, coral and cobble along the inner, middle and outer continental shelf, upper slope, nearshore bays and island passages of the GOA from Dixon Entrance to 170° W. longitude from and the lower portion of the water column. High concentrations are found associated with high relief containing refuge spaces such as overhangs, crevices and caves. Feeding areas contain fish, shrimp and crab.

4.2.2.14 Thornyhead Rockfish

Eggs - Level 0_a: Pelagic waters of the GOA from Dixon Entrance to 170° W. longitude during the late winter and early spring.

Larvae (duration <15 months) - Level 0_a: Pelagic waters extending to the seaward boundary of the EEZ of the GOA from Dixon Entrance to 170° W. longitude during the early spring through summer.

Juveniles (> 15 months) - Level 0_a: Areas of mud, sand, rock, sandy mud, cobble, muddy sand, and gravel and the lower portion of the water column along the middle and outer continental shelf and upper slope of the GOA from Dixon Entrance to 170° W. longitude.

Adults - Level 1: Areas of mud, sand, rock, sandy mud, cobble, muddy sand, and gravel and the lower portion of the water column along the middle and outer continental shelf and upper slope of the GOA from Dixon Entrance to 170° W. longitude. Feeding areas contain shrimp, fish (cottids), and small crabs.

4.2.2.15 Atka Mackerel

Eggs (40-45 days) - Level 0_a: Areas of gravel, rock and kelp in shallow water, island passes, and the inner continental shelf of the GOA from Kodiak Island to 170° W. longitude.

Larvae (up to 6 months) - Level 0_a: Epipelagic waters of the middle and outer continental shelf, slope, and extending seaward to the edge of the EEZ of the GOA from Kodiak Island to 170° W. longitude.

Juveniles (up to 2 years) - Level 0_b: Unknown habitat association; assumed to settle near areas inhabited by adults, but have not been observed in fishery or surveys.

Adults - Level 1: Areas of gravel, rock and kelp on the inner, middle and outer continental shelf and the entire water column (to the surface) of the GOA from Kodiak Island to 170° W. longitude. Feeding areas contain copepods, euphausiids and meso-pelagic fish (myctophids). Spawning occurs in nearshore (inner shelf and island passes) rocky areas and in kelp in shallow waters in summer. Move to offshore deeper areas nearby in winter. Perform diurnal/tidal movements between demersal and pelagic areas.

4.2.2.16 Skates

Eggs - Level 0_a: All bottom substrates of the slope and across the shelf throughout the GOA from Dixon Entrance to 170° W. longitude.

Larvae - no EFH definition determined: Not applicable (no larval stage)

Juveniles - Level 0_a: Broad range of substrate types (mud, sand, gravel, and rock) and the water column on the shelf and the upper slope of the GOA from Dixon Entrance to 170° W. longitude.

Adults - Level 1: Broad range of substrate types (mud, sand, gravel, and rock) and the lower portion of the water column on the shelf and the upper slope of the GOA from Dixon Entrance to 170° W. longitude.

4.2.2.17 "Other Species"

Red Squid

Eggs - Level 0_a: Areas of mud and sand on the upper and lower slope throughout the GOA from Dixon Entrance to 170° W. longitude.

Larvae - no EFH definition determined: Not applicable (no larval stage).

Juveniles and Adults - Level 0_a: Pelagic waters of the shelf, slope and basin to the seaward edge of the EEZ in the GOA from Dixon Entrance to 170° W. longitude. Feeding areas contain euphausiids, shrimp, forage fish, and other cephalopods.

Sculpins

Eggs - Level 0_a: All substrates on the inner, middle and outer continental shelf of the GOA from Dixon Entrance to 170° W. longitude. Some species deposit eggs in rocky shallow waters near shore.

Larvae - Level 0_a: Pelagic waters of the inner, middle and outer continental shelf and slope of the GOA from Dixon Entrance to 170° W. longitude, predominately over the inner and middle shelf.

Juveniles - Level 0_a: Broad range of demersal habitats from intertidal pools, all shelf substrates (mud, sand, gravel, etc.) and rocky areas of the upper slope of the GOA from Dixon Entrance to 170° W. longitude.

Adults - Level 1: Broad range of demersal habitats from intertidal pools, all shelf substrates (mud, sand, gravel, etc.) and rocky areas of the upper slope of the GOA from Dixon Entrance to 170° W. longitude.

Sharks

Eggs - no EFH definition determined: Not applicable (most are oviparous).

Larvae - no EFH definition determined: Not applicable (no larval stage).

Juveniles and Adults - Level 0_a: All waters and substrate types in the inner, middle and outer continental shelf and slope of the GOA from Dixon Entrance to 170° W. longitude.

Octopus

Eggs - Level 0_a: All bottom substrates of the shelf throughout the GOA from Dixon Entrance to 170° W. longitude.

Larvae - no EFH definition determined: Not applicable (no larval stage).

Juveniles and Adults - Level 0_a: Broad range of substrate types (mostly rock, gravel, and sand) and the lower portion of the water column on the shelf and the upper slope of the GOA from Dixon Entrance to 170° W. longitude. Feeding areas contain crustaceans and molluscs.

4.2.2.18 Forage Fish Complex

Eulachon

Eggs (duration 30-40 days) - Level 0_a: Bottom substrates of sand, gravel and cobble in rivers during April-June.

Larvae (duration 1-2 months) - Level 0_a: Pelagic waters of the inner continental shelf throughout the GOA from Dixon Entrance to 170° W. longitude.

Juveniles (to 3 years of age) - Level 0_a: Pelagic waters of the middle and outer continental shelf and upper slope throughout the GOA from Dixon Entrance to 170° W. longitude.

Adults (3+ years) - Level 0_a: Pelagic waters of the middle to outer continental shelf and upper slope throughout the GOA from Dixon Entrance to 170° W. longitude for non-spawning fishes (July-April). Feeding areas contain euphausiids and copepods. Rivers during spawning (April-June).

Capelin

Eggs (duration 2-3 weeks) - Level 0_a: Sand and cobble intertidal beaches down to 10 m depth along the shores of the GOA from Dixon Entrance to 170° W. longitude during May-August.

Larvae (duration 4-8 months) - Level 0_a: Epipelagic waters of the inner and middle continental shelf throughout the GOA from Dixon Entrance to 170° W. longitude.

Juveniles (1-2 yrs) - Level 0_a: Pelagic waters of the inner and middle continental shelf throughout the GOA from Dixon Entrance to 170° W. longitude. May be associated with fronts in winter.

Adults (2+ yrs)- Level 0_a: Pelagic waters of the inner, middle and outer continental shelf throughout the GOA from Dixon Entrance to 170° W. longitude during their non-spawning cycle (September-April). Populations associated with fronts in winter. Intertidal beaches of sand and cobble down to 10 m depth during spawning (May-August).

Myctophids and Bathylagids

Eggs - Level 0_c - no EFH definition determined: No information available at this time.

Larvae - Level 0_c - no EFH definition determined: No information available at this time.

Juveniles - Level 0_a: Pelagic waters ranging from near surface to lower portion of water column of the slope and basin regions throughout the GOA from Dixon Entrance to 170° W. longitude, and to the seaward extent of the EEZ.

Adults - Level 0_a: Pelagic waters ranging from near surface to lower portion of water column of the slope and basin regions throughout the GOA from Dixon Entrance to 170° W. longitude, and to the seaward extent of the EEZ.

Sand lance

Eggs (3-6 weeks) - Level 0_a: Bottom substrate of sand to sandy gravel along the inner continental shelf throughout the GOA from Dixon Entrance to 170° W. longitude.

Larvae (100-131 days) - Level 0_a: Pelagic and neustonic waters along the inner continental shelf throughout the GOA from Dixon Entrance to 170° W. longitude.

Juveniles - Level 0_a: Soft bottom substrates (sand, mud) and the entire water column of the inner and middle continental shelf throughout the GOA from Dixon Entrance to 170° W. longitude. Feeding areas contain zooplankton, calanoid copepods, mysid shrimps crustacean larvae, gammarid amphipods and chaetognaths.

Adults - Level 0_a: Soft bottom substrates (sand, mud) and the entire water column of the inner and middle continental shelf throughout the GOA from Dixon Entrance to 170° W. longitude. Feeding areas contain zooplankton, calanoid copepods, mysid shrimps crustacean larvae, gammarid amphipods and chaetognaths.

Sand fish

Eggs - Level 0_a: Egg masses attached to rock in nearshore areas throughout the eastern Bering Sea and the Aleutians Islands.

Larvae - Level 0_c - no EFH definition determined: No information available at this time.

Juveniles - Level 0_a: Bottom substrates of mud and sand of the inner continental shelf throughout the GOA from Dixon Entrance to 170° W. longitude.

Adults - Level 0_a: Bottom substrates of mud and sand of the inner continental shelf throughout the GOA from Dixon Entrance to 170° W. longitude.

Pholids and Stichaeids

Eggs - Level 0_c - no EFH definition determined: No information available at this time.

Larvae - Level 0_c - no EFH definition determined: No information available at this time.

Juveniles - Level 0_a: Intertidal to demersal waters of the inner continental shelf with mud substrate throughout the GOA from Dixon Entrance to 170° W. longitude. Certain species are associated with vegetation such as eelgrass and kelp.

Adults - Level 0_a: Intertidal to demersal waters of the inner continental shelf with mud substrate throughout the GOA from Dixon Entrance to 170° W. longitude. Certain species are associated with vegetation such as eelgrass and kelp.

Gonostomatids

Eggs - Level 0_c - no EFH definition determined: No information is available at this time.

Larvae - Level 0_c - no EFH definition determined: No information is available at this time.

Juveniles - Level 0_c - no EFH definition determined: No information is available at this time.

Adults - Level 0_a: Bathypelagic waters throughout the GOA from Dixon Entrance to 170° W. longitude and to the seaward extent of the EEZ.

Euphausiids

Eggs - Level 0_a: Neustonic waters throughout the GOA from Dixon Entrance to 170° W. longitude and to the seaward extent of the EEZ in spring.

Larvae - Level 0_a: Epipelagic waters throughout the GOA from Dixon Entrance to 170° W. longitude and to the seaward extent of the EEZ in spring.

Juveniles - Level 0_a: Pelagic waters throughout the GOA from Dixon Entrance to 170° W. longitude and to the seaward extent of the EEZ. Dense populations are associated with upwelling or nutrient-rich areas, such as the edge of the continental shelf, heads of submarine canyons, edges of gullies on the continental shelf, in island passes in the Aleutian Islands and over submerged seamounts.

Adults - Level 0_a: Pelagic waters throughout the GOA from Dixon Entrance to 170° W. longitude and to the seaward extent of the EEZ. Dense populations are associated with upwelling or nutrient-rich areas, such as the edge of the continental shelf, heads of submarine canyons, edges of gullies on the continental shelf, in island passes in the Aleutian Islands, and over submerged seamounts.

4.2.3 Habitat Areas of Particular Concern

There are several habitat types in Alaska that have important ecological functions, are sensitive and vulnerable to human impacts, and are relatively rare. A summary of these habitat types is provided below.

4.2.3.1 Living Substrates in Shallow Waters

Habitat areas of particular concern include nearshore areas of intertidal and submerged vegetation, rock, and other substrates. These areas provide food and rearing habitat for juvenile groundfish and spawning areas of some species (e.g., Atka mackerel, yellowfin sole), and may have a high potential to be affected by shore-based activities.

Shallow inshore areas (less than 50 m depth) are very important to king crab reproduction. After molting through four larval (zoea) stages, king crab larvae develop into glaucothoe which are young crabs that settle in the benthic environment in nearshore shallow areas with significant cover, particularly those with living substrates (macroalgae, tube building polychaete worms, kelp, mussels, and erect bryozoans). The area north and adjacent to the Alaska peninsula (Unimak Island to Port Moller) and the eastern portion of Bristol Bay are locations known to be particularly important for rearing juvenile king crab.

All nearshore marine and estuarine habitats used by Pacific salmon, such as eel grass beds, submerged aquatic vegetation, emergent vegetated wetlands, and certain intertidal zones, are sensitive to natural or human induced environmental degradation, especially in urban areas and in other areas adjacent to intensive human-induced developmental activities. Many of these areas are unique and rare. The coastal zone is under the most intense development pressure, and estuarine and intertidal areas are limited in comparison with the areal scope of other marine habitats for salmon.

Herring also require shallow water living substrates for reproduction. Spawning takes place near the shoreline between the high tide level and 11 m. Herring deposit their eggs on vegetation, primarily rockweed (*Fucus*

sp.) and eelgrass (*Zostera sp.*). These "seaweeds" are found along much of the Alaska coastline, but they often occur in discrete patches.

4.2.3.2 Living Substrates in Deep Waters

Habitat areas of particular concern include offshore areas with substrates of high-micro habitat diversity, which serve as cover for groundfish and other organisms. These can be areas with rich epifaunal communities (e.g., coral, anemones, bryozoans, etc.), or with large particle size (e.g., boulders, cobble). Complex habitat structures are considered most readily impacted by fishing activities (see previous sections of this document).

Corals are generally considered to be very slow growing organisms, and are a habitat of particular concern. Although scientists are not quite sure of coral's importance to fish habitat, it would certainly provide vertical structure for fish to use for protection and cover. Some support to this claim have been provided by submersible observations. Coral habitat is likely very sensitive to human-induced environmental degradation from both fishing and non-fishing threats. It is not known how much coral there is off the coast of Alaska, but it is likely to be rare relative to other habitat types.

There are several species of deepwater coral found off Alaska. Two common species are red tree coral (*Primnoa willeyi*) and sea raspberry (*Eunephtya sp.*). Although these corals are thought to be distributed throughout the GOA and Aleutian Islands, much of the data analysis has focused on the eastern GOA. NMFS trawl surveys have indicated high concentrations in the immediate vicinity of Dixon Entrance, Cape Ommaney, and Alsek Valley. In the GOA, NMFS surveys have taken red tree coral in very deep areas (125-210 fathoms), whereas sea raspberries have generally been taken in shallower areas (70-110 fathoms).

Information on coral distribution has been summarized in a 1981 report by R. Cimberg, T. Gerrodette, and K. Muzik titled, "Habitat Requirements and Expected Distribution of Alaska Coral." Though this report was written in the context of potential impacts of oil and gas exploration and development, information on habitat and distribution is relevant for our purposes. Though the report discusses coral distributions throughout Alaska, the focus here is on the information contained relevant to southeast Alaska.

The study notes that this Region probably has the largest number of coral species due tot he variety of habitats in terms of depth, substrate, temperature, and currents. *Primnoa sp.*, or red tree corals, are more abundant in southeast Alaska than in any other region. Other species of fan corals have been observed as well as bamboo corals, cup corals, soft corals, and hydrocorals. The greatest number of distributional records for red tree corals are from the GOA, in particular from the inside waters of southeast Alaska. In southeast Alaska, red tree corals have frequently been reported in Chatham Strait, Frederick Sound, and Behm Canal. The frequency of occurrences increases toward the ocean entrances and further away from the fjords. This trend is likely due to swifter currents near the entrances and/or greater turbidity and lower salinities in the fjords. Areas of highest densities are found in regions where currents are 3/4 knots.

Distributional records were additionally analyzed relative to the depths at which they occurred. Red tree corals have been reported at depths from 10 to 800 m. The lower depth limit varied in different regions of Alaska, increasing along a geographic gradient from the Aleutians to southeast Alaska. The lower depth limit of these corals in each area corresponds with a mean spring temperature of 3.7° C. The report indicates that in southeast Alaska there is a difference in the lower depth limit exhibited north of 57° N. latitude and that experienced south of that line (roughly running through Sitka). The data from the report indicate that, in the area of southeast Alaska north of 57° N. latitude, red tree corals are predominately found between 50 and 150 meters in depth. Significant occurrences continue to exist from 150 to 250 m, and taper off rapidly beyond 250 m south of the 57° N. latitude line, they occur over a broader depth range with equal occurrences from

50 to 450 m. The report indicates that other species of sea fans may be found deeper than *Primnoa,* at depths up to 2,000 m.

Bamboo corals also occur in the waters of both the inside passages of southeast Alaska and in the southeast GOA. These corals have a lower temperature tolerance, about 3° C, and exist in depths from 300-3,500 m. These corals are also expected to exist in a rocky, stable substrate and have a low tolerance for sediments.

The depth distribution of soft corals is, like the red tree corals, expected to range from 10-800 m, though they may exist on a much wider range of substrates. Hydrocorals, also occurring in southeast Alaska, have a depth range of 700-950 m, though they may occur at shallower depths in southeast Alaska than in the more northern, colder waters.

The report notes (again in the context of potential disturbance by oil and gas exploration and development) that recolonization of tropical coral communities requires at least several decades to recover from major perturbations. Alaskan corals would likely take much longer to recolonize following similar disturbances. For example, given a predicted growth rate of 1 cm/year for *Primnoa sp.*, a colony 1 m high would require at least 100 years to return to the pre-impacted state. This, of course, is regardless of the origin of the impact.

4.2.3.3 Freshwater Areas Used by Anadromous Fish

Habitat Areas of Particular Concern also include all anadromous streams, lakes, and other freshwater areas used by Pacific salmon and other anadromous fish (such as smelt), especially in urban areas and in other areas adjacent to intensive human-induced developmental activities.

4.2.4 Essential Fish Habitat Recommendations

Appendix F contains a description of potential adverse effects on EFH from fishing and non-fishing activities. Based on this assessment, Sections 4.2.4.1 and 4.2.4.2 contain habitat conservation and enhancement recommendations for non-fishing and fishing threats to EFH.

4.2.4.1 Habitat Conservation and Enhancement Recommendations for Non-fishing Threats to Essential Fish Habitat

Habitat alteration may lower both the quantity and quality of species production through physical changes or chemical contamination of habitat. Species and individuals within species differ in their tolerance to effects of habitat alteration. It is possible for the timing of a major alteration event and the occurrence of a large concentration of living marine resources to coincide in a manner that may affect fishery stocks and their supporting habitats. The effects of such events may be masked by natural phenomena or may be delayed in becoming evident. However, the process of habitat degradation more characteristically begins with small-scale projects that result in only minor losses or temporary disruptions to organisms and habitat. As the number and rate of occurrence of these and other major projects increases, their cumulative and synergistic effects become apparent over larger areas. It is often difficult to separate the effects of habitat alteration from other factors such as fishing mortality, predation, and natural environmental fluctuations. Decreasing the probability of impact will lead to the highest protection of EFH. The probability of impact directly relates to the amount of human activity we introduce to an environment. Recommendations are offered to protect EFH in Tables 4-3, 4-4, and 4-5.

Table 4-3 Near Shore Habitat and Waters (0-3 nm)

Recommendation	Area	Species
Minimize construction of structures such as causeways or breaches that would affect local flushing, water temperatures, water quality, lateral drift, and/or migration.	Sensitive areas, special aquatic and vegetation areas	groundfish, salmon, scallop, crab
Minimize construction of structures such as docks that ground on tidal lands during low water events.	Sensitive areas, special aquatic and vegetation areas	groundfish, salmon, crab
Minimize deposition of fill in tidelands.	Sensitive areas, special aquatic and vegetation areas	groundfish, salmon, crab
Stage rapid response equipment and establish measures for accidental impacts such as oil and hazardous material spills.	ports, sensitive areas	groundfish, salmon, scallop, crab
Monitor point source pollution sites such as fish processing waste, sewage, and storm water run off outfalls.	ports, vessel processors, communities	groundfish, salmon, scallop, crab
Minimize disposal or dumping of dredge spoils, drilling muds, and municipal and industrial wastes.	known concentration of bottom species and their habitats	groundfish, salmon, scallop, crab
Test dredge spoils prior to marine disposal	port and upland sources	groundfish, salmon, scallop, crab
Establish monitoring that incorporates Federal and State regulatory agency determinations, i.e., tracking database and GIS system	area wide	groundfish, salmon, scallop, crab

Table 4-4 Pelagic Habitat and Waters (3-12 nm)

Recommendation	Area	Species
Assess cumulative oil and gas production activities.	BSAI, Chukchi Sea, OCS, Cook Inlet, GOA	groundfish, salmon, scallop, crab
Identify marine disposal sites.	area wide	groundfish, salmon, scallop, crab
Establish monitoring that incorporates Federal and State regulatory agency determinations, i.e., tracking database and GIS system	area wide	groundfish, salmon, scallop, crab
Establish no discharge zones for ballast waters to prevent introduction of non-indigenous species and chemical contaminants.	ports, known gyres areas	groundfish, salmon, scallop, crab
Minimize disposal or dumping of dredge spoils, drilling muds, and municipal and industrial wastes.	known concentration of bottom species and their habitats	groundfish, salmon, scallop, crab

Table 4-5 Offshore Habitat and Waters (>12 nm)

Recommendation	Area	Species
Establish monitoring that incorporates Federal and State regulatory agency determinations, i.e., tracking database and GIS system	area wide	groundfish, salmon, scallop, crab
Establish no discharge zones for ballast waters to prevent introduction of non-indigenous species and chemical contaminants.	known offshore gyre areas	groundfish, salmon, scallop, crab
Minimize disposal or dumping of dredge spoils, drilling muds, and municipal and industrial wastes.	known concentration of bottom species and their habitats	groundfish, salmon, scallop, crab

4.2.4.2 Habitat Conservation and Enhancement Recommendations for Fishing Threats to Essential Fish Habitat

Area closures to trawling and dredging in the GOA management area serve to protect EFH from potential adverse impacts caused by these gear types. Other management measures, such as Sitka Pinnacles Marine Reserve, are designed to reduce the impact of fishing on marine ecosystems. Catch quotas, bycatch limits and gear restrictions control removals of prey species. Studies that compare seafloor habitats in areas heavily

trawled with areas that have had little trawl effort may reveal future habitat conservation and enhancement measures necessary to protect EFH. Additionally, the annual review of existing and new EFH information during the SAFE report development process is expected to identify adverse effects to EFH from fishing and proposals to amend the FMP to minimize those adverse effects. Proposals can be submitted during the Council's plan amendment cycle.

4.3 Fishing Activities Affecting the Stocks

The Gulf of Alaska management area is utilized primarily by commercial fisheries. The groundfish fisheries have been entirely domestic since 1991 (a history of exploitation is addressed in Section 4.3.1). The commercial fleet is described in Section 4.3.2. There is also subsistence fishing for groundfish species (Section 4.3.3) in the GOA, although most of this activity takes place within state waters (0-3 nm). Recreational catch of groundfish in the GOA is described in Section 4.3.4.

4.3.1 History of Exploitation

The oldest fisheries in the GOA are the native subsistence fisheries for Pacific halibut, cod, herring, and other species. Catches were traded or sold to the Russians and later to the Americans after the purchase of Alaska by the United States in 1867. Groundfish and herring are still important sources of food to many groups of Alaskan natives, although these subsistence harvests are now dwarfed by commercial operations.

The first commercial groundfish fishery in the GOA was a setline fishery for cod by U.S. nationals in 1867. Later U.S. fisheries developed on halibut, sablefish, and other groundfish. Canadians were involved in fisheries in the GOA from the beginning of this century and directed most of their effort on halibut.

The commercial fishery for halibut began in coastal waters off Washington and British Columbia and expanded from there into the GOA after World War I. Both U.S. and Canadian nationals were involved in the fisheries, and in 1923 the United States and Canada ratified a halibut conservation treaty to regulate the fishery and to conduct research. The convention established the International Fisheries Commission, which was changed to the International Pacific Halibut Commission in 1953. Because of a combination of over-fishing and environmental factors, the abundance of halibut declined and a new convention was signed in 1930 to broaden the Commission's regulatory powers for the rebuilding of the halibut stocks. Under scientific management, the halibut stocks were gradually rebuilt. In 1962 the landings from the GOA reached an all-time high of 31,400 mt. High annual catches continued until 1966 followed by a decline so that by 1977 only 9,200 mt were landed. Canadian fishing in the GOA ended in 1981 as a result of extended U.S. jurisdiction.

The sablefish fishery began about 1906, and was relatively unimportant until about 1935 when the catch began to increase with effort continuing through the war years. Since 1946 the harvest has fluctuated from low levels to as high as 36,000 mt taken by foreign fleets in 1972. Following a period of stock decline, the fishery has now expanded to all areas of the GOA.

The Asian trawl fisheries on GOA groundfish began in 1962 when a Soviet fleet of 70 trawlers and support ships targeted on Pacific ocean perch, an abundant groundfish of the outer continental shelf and upper slope. The next year Japanese fishing vessels of lesser numbers entered the GOA and began directed fisheries on POP and sablefish. The Asian trawl fisheries expanded rapidly in the 1960s. POP was the first major species targeted by foreign fisheries. The combined effort of the Asian fisheries on POP stocks accounted for approximately 152,000 mt in 1966. The GOA foreign catch of POP steadily decreased through the 1970s, and by 1979 decreased to nearly 7,300 mt. By 1983, the catch decreased further to approximately 5,400 mt and in 1985 only bycatch amounts were allocated by the Council. In addition to POP, foreign fisheries have

targeted on pollock, sablefish, flounder, rockfish, Pacific cod, Atka mackerel, and squid. 1986 was the last year of directed foreign harvests, which were limited to pollock and Pacific cod. Japan, U.S.S.R., and Republic of Korea were the major foreign participants in the GOA fisheries, although Canada, Poland, and Mexico also harvested relatively insignificant levels of catch.

With the advent of the Magnuson Fishery Conservation and Management Act of 1976 (later amended to the Magnuson-Stevens Fishery Conservation and Management Act), the exploitation and management of the fisheries resources of the GOA began to change. Domestic commercial groundfish fisheries steadily increased after 1978. Between 1978 and 1990, joint venture partnerships between U.S. catcher vessels and foreign processing vessels helped to build up U.S. capacity. Since 1991, the entire GOA groundfish harvest and processing has been entirely domestic.

Catch History

Catch statistics since 1956 are shown for the GOA in Table 4-6. The initial target species was sablefish, followed in the early 1960s by POP. During the early period of these fisheries, total catches of groundfish reached a peak of 360,131 mt in 1965. Following a decline in abundance of POP, other species (pollock, Pacific cod, other flatfish) were targeted. Since 1978, catches have varied from 146,703 mt to 356,659 mt, and have averaged around 180,000 mt in the early 2000s.

Table 4-6a Groundfish and squid catches in the Gulf of Alaska, 1956-2004 (pollock, Pacific cod, sablefish, flatfish), in metric tons.

Year	Pollock	Pacific Cod	Sablefish	Flatfish[a]	Arrowtooth flounder
1956			1,391		
1957			2,759		
1958			797		
1959			1,101		
1960			2,142		
1961			897		
1962			731		
1963			2,809		
1964	1,126	196	2,457	1,028	
1965	2,749	599	3,458	4,727	
1966	8,932	1,376	5,178	4,937	
1967	6,276	2,225	6,143	4,552	
1968	6,164	1,046	15,049	3,393	
1969	17,553	1,335	19,376	2,630	
1970	9,343	1,805	25,145	3,772	
1971	9,458	523	25,630	2,370	
1972	34,081	3,513	37,502	8,954	
1973	36,836	5,963	28,693	20,013	
1974	61,880	5,182	28,335	9,766	
1975	59,512	6,745	26,095	5,532	
1976	86,527	6,764	27,733	6,089	
1977	112,089	2,267	17,140	16,722	
1978	90,822	12,190	8,866	15,198	
1979	98,508	14,904	10,350	13,928	
1980	110,100	35,345	8,543	15,846	
1981	139,168	36,131	9,917	14,864	
1982	168,693	29,465	8,556	9,278	
1983	215,567	36,540	9,002	12,662	
1984	307,400	23,896	10,230	6,914	
1985	284,823	14,428	12,479	3,078	
1986	93,567	25,012	21,614	2,551	
1987	69,536	32,939	26,325	9,925	
1988	65,625	33,802	29,903	10,275	
1989	78,220	43,293	29,842	11,111	
1990	90,490	72,517	25,701	15,411	
1991	107,500	76,997	19,580	20,068	
1992	93,904	80,100	20,451	28,009	
1993	108,591	55,994	22,671	37,853	
1994	110,891	47,985	21,338	29,958	
1995	73,248	69,053	18,631	32,273	
1996	50,206	67,966	15,826	19,838	22,183
1997	89,892	68,474	14,129	17,179	16,319
1998	123,751	62,101	12,758	11,263	12,974
1999	95,637	68,613	13,918	8,821	16,209
2000	71,876	54,492	13,779	13,052	24,252
2001	70,485	41,614	12,127	11,817	19,964
2002	50,712	42,335	12,484	12,895	21,231
2003	49,516	40,958	14,319	11,497	29,993
2004	62,200	55,638	16,672	7,478	15,255

[a]Includes all flatfish species, including arrowtooth flounder between 1964-1995.

Table 4-6b **Groundfish and squid catches in the Gulf of Alaska, 1956-2004** (rockfish, Atka mackerel, "other species", total of all species), in metric tons.

Year	Slope rockfish[a]	Pelagic shelf rockfish[b]	Demersal shelf rockfish	Thornyhead rockfish	Atka mackerel[c]	Skates[d]	Other species[e]	Total (all species)
1956								1,391
1957								2,759
1958								797
1959								1,101
1960								2,142
1961	16,000							16,897
1962	65,000							65,731
1963	136,300							139,109
1964	243,385							248,192
1965	348,598							360,131
1966	200,749							221,172
1967	120,010							139,206
1968	100,170							125,822
1969	72,439							113,333
1970	44,918							84,983
1971	77,777							115,758
1972	74,718							158,768
1973	52,973							144,478
1974	47,980							153,143
1975	44,131							142,015
1976	46,968							174,081
1977	23,453				19,455		4,642	195,768
1978	8,176				19,588		5,990	160,830
1979	9,921				10,949		4,115	162,675
1980	12,471			1,351	13,166		5,604	202,426
1981	12,184			1,340	18,727		7,145	239,476
1982	7,991		120	788	6,760		2,350	234,001
1983	7,405		176	730	12,260		2,646	296,988
1984	4,452		563	207	1,153		1,844	356,659
1985	1,087		489	81	1,848		2,343	320,656
1986	2,981		491	862	4		401	147,483
1987	4,981		778	1,965	1		253	146,703
1988	13,779	1,086	508	2,786	-		647	158,411
1989	19,002	1,739	431	3,055	-		1,560	188,253
1990	21,114	1,647	360	1,646	1,416		6,289	236,591
1991	13,994	2,342	323	2,018	3,258		1,577	247,657
1992	16,910	3,440	511	2,020	13,834		2,515	261,694
1993	14,240	3,193	558	1,369	5,146		6,867	256,482
1994	11,266	2,990	540	1,320	3,538		2,752	232,578
1995	15,023	2,891	219	1,113	701		3,433	216,585
1996	14,288	2,302	401	1,100	1,580		4,302	199,992
1997	15,304	2,629	406	1,240	331		5,409	231,312
1998	14,402	3,111	552	1,136	317		3,748	243,113
1999	18,057	4,826	297	1,282	262		3,858	231,780
2000	15,683	3,730	406	1,307	170		5,649	204,396
2001	16,479	3,008	301	1,339	76		4,801	182,011
2002	17,168	3,322	244	1,138	85		4,040	164,664
2003	18,683	3,048	252	1,158	578	3,330	6,337	176,341
2004	18,200	2,651	312	866	818	2,817	1,649	184,557

[a]Catch defined as follows: 1961-78, Pacific ocean perch (*Sebastes Alutus*) only; 1979-1987, the 5 species of the Pacific ocean perch complex, 1988-90 the 18 species of the slope rockfish assemblage; 1991-, the 20 species of the slope rockfish assemblage.

[b]Up to 1998, included dusky, yellowtail, widow, black, and blue rockfish; black and blue rockfish were then removed from the FMP.

[c]Atka mackerel was added to the other species category in 1988; catch was recorded separately for 1990-1992, thereafter Atka mackerel was assigned as a separate target species.

[d]In response to a directed fishery that developed in 2003, skates were moved from 'other species' to a separate target category in 2004.

[e]After numerous changes, the category was stabilized in 1981 to include sharks, skates, sculpins, eulachon, capelin (and other *Osmeridae* smelts), and octopus. Squid was added in 1989. Eulachon and capelin were moved to the forage fish category in 1999.

4.3.2 Commercial Fishery

This section contains a general discussion of the commercial groundfish fisheries in the GOA. The information in this section comes from the annually (or biennially for some species) updated *Stock Assessment and Fishery Evaluation* report (NPFMC 2003), in particular the *Economic Status of the Groundfish Fisheries off Alaska* appendix (Hiatt *et al.* 2003). This document is available on the Council website, or by request from the Council office. Additionally, catch data is also reported on the NMFS Alaska region website. Website addresses for the Council and NMFS are included in Chapter 6.

In 2002, 824 vessels participated in the groundfish fisheries in the GOA. Of these, 642 were hook-and-line vessels, 131 pot vessels, and 123 trawl vessels. Total groundfish catch was 165,000 mt, which represents approximately 8 percent of the total groundfish catch off Alaska. Pollock and Pacific cod represented the largest part of the harvest in terms of weight. Total ex-vessel value of the GOA groundfish catch in 2002 was $137.3 million, with sablefish and Pacific cod accounting for three quarters of the total ex-vessel value.

The domestic pollock fishery began in the GOA in 1976 when a fleet of three trawlers from Petersburg trawled for pollock during the winter months. Approximately 60 mt of pollock were landed to shoreside processors. Pelagic trawl gear is the principle gear type that is utilized in the pollock fishery. A large majority of the pollock fishery concentrates in the Central regulatory area, although in 2002 approximately 20 percent of the pollock catch was landed in the Western area. Since 1998, full retention of pollock is required under the Improved Retention/Improved Utilization program. In 2002, the approximately 42,000 mt of pollock harvested in the GOA had an ex-vessel value of $24 million.

Pacific cod have been landed domestically since the late 1950s and early 1960s, however the fishery did not really begin to develop until 1978. Unlike most species, which are harvested predominately by one type of gear accounting typically for 90 percent or more of the catch, Pacific cod is taken by trawl, hook-and-line, and pot gear types. In 2002, 35 percent of the catch was taken by vessels using hook-and-line gear, and 47 percent by trawl gear, with the remainder by pot vessels. As with pollock, since 1998, full retention of Pacific cod is required in the GOA under the IR/IU program. In 2002, the approximately 42,000 mt of Pacific cod harested in the GOA had an ex-vessel value of $45.3 million.

The U.S. longline fishery for sablefish began expanding in 1982 in the GOA and in 1988, harvested all sablefish taken in Alaska, except minor joint venture catches. Following the domestication of the fishery, the previously year-round season in the GOA began to shorten in 1984. By the late 1980s, the average season length decreased to one to two months, and was even as short as 10 days in some areas. In 1995 an Individual Fishing Quota (IFQ) program was implemented for the hook-and-line sablefish fishery, along with a season running from March to November. The sablefish IFQ fishery runs concurrently with the halibut IFQ fishery. IFQ management has increased fishery catch rate and decreased the harvest of immature fish, as well as increasing efficiency resulting in a savings in operating costs averaging $3.1 million annually. The directed sablefish fishery is primarily a hook-and-line fishery, although sablefish are also caught incidentally during directed trawl fisheries for species groups such as rockfish and deepwater flatfish. In 2002, the almost 12,500 mt of sablefish harvested in the GOA had an ex-vessel value of $57.6 million.

The flatfish fishery also became entirely domestic in 1988. Since that time, the majority of the flatfish harvest has occurred on the continental shelf and slope east of Kodiak Island, in the Central regulatory area. The flatfish assemblage is managed in 5 target categories: deep water flatfish complex, rex sole, shallow water flatfish complex, flathead sole, and arrowtooth flounder. Arrowtooth flounder in the GOA is a species of high abundance but low commercial value. The ex-vessel value of all flatfish in the GOA in 2002 was $3.5 million, for 34,100 mt (of which 21,200 mt was arrowtooth flounder). The flatfish resources were lightly to moderately harvested in 2002, compared to their acceptable biological catch levels. The flatfish fisheries have

been and are likely to continue to be limited by the potential for high bycatch of Pacific halibut, which can result in target fishery closure due to reaching the halibut PSC limit prior to achieving the target species TAC. Since 2003, full retention of shallow-water flatfish is required under the IR/IU program.

The domestic fishery for rockfish became important in 1985, and expanded each year until full domestication in 1991. In 2002, the almost 22,000 mt of rockfish harvested in the GOA had an ex-vessel value of $6.7 million. Pacific ocean perch was initially the primary target, however in the early 1990s, overall catch of slope rockfish diminished due to more restrictive management policies intended to promote rebuilding of POP stocks. During this time, catches of lower valued shelf rockfish, such as dusky rockfish, increased. Since 1996, increasing POP biomass has once again raised slope rockfish TACs. In 2002, slope rockfish accounted for 78 percent of GOA rockfish catch. Since the late 1990s, shore-based trawlers delivering to Kodiak processors have begun taking around 50 percent of the POP catch in the Central regulatory area, although catcher/processors continue to dominate catch in the Western and Eastern areas. Historically, bottom trawls have accounted for nearly all the commercial harvest of POP, however in recent years, a sizable portion of the catch has been taken by pelagic trawls. The 1998 trawl closure off Southeast Alaska east of 140° W. longitude significantly affected all rockfish catch in that area. The demersal shelf rockfish fishery is managed by the State of Alaska with Council oversight. It occurs exclusively in the Southeast Outside district. Price per pound has increased significantly over time. Since 2004, full retention of demersal shelf rockfish is required.

The directed skate fishery developed in 2003 in the Western and Central regulatory areas, around Kodiak Island, while skates were still managed under a group TAC as part of the 'other species' category. In response to conservation and management concerns, skates were moved to the target species category beginning in 2004. Skate catch in 2003 totaled 3,300 mt. Vessels using both hook-and-line and trawl gear retained skate catch in 2003.

The discards of groundfish in the groundfish fishery have received increased attention in recent years by NMFS, the Council, Congress, and the public at large. The discard rate is the percent of total catch that is discarded. For the GOA groundfish fisheries as a whole, the annual discard rate for groundfish decreased from 18.6 percent in 1994 (total discards, 43,500 mt) to 13.9 percent in 2002 (total discards, 23,100 mt).

The bycatch of Pacific halibut, crab, Pacific salmon, and Pacific herring has been an important management issue in the commercial fishery for more than twenty years. The retention of these species was first prohibited in the foreign groundfish fisheries, to ensure that groundfish fishers had no incentive to target on these species. Estimates of bycatch of these prohibited species are assessed annually in the *Stock Assessment and Fishery Evaluation* report. Additionally, management measures such as prohibited species catch limits and time and area closures regulate bycatch in the groundfish fisheries.

An extensive at-sea observer program was developed for the foreign fleets and then extended to the domestic fishery once it had all but replaced foreign participation. The North Pacific Groundfish Observer Program resulted in fundamental changes in the nature of the bycatch program. First, by providing good estimates of total groundfish catch and non-groundfish bycatch by species, it eliminated much of the concern that total fishing mortality was being underestimated due to fish that were discarded at sea. Second, it made it possible to establish, monitor, and enforce the groundfish quotas in terms of total catch as opposed to only retained catch. For groundfish fisheries, this means that both retained catch and discarded catch are counted against TACs. Third, it made it possible to implement and enforce bycatch quotas for the non-groundfish species that by regulation had to be discarded at sea. Finally, it provided extensive information that managers and the industry could use to assess methods to reduce bycatch and bycatch mortality. In summary, the observer program provided fishery managers with the information and tools necessary to prevent bycatch from

adversely affecting the stocks of the bycatch species. Therefore, bycatch in the groundfish fisheries is principally not a conservation problem, although it can be an allocation problem.

4.3.3 Subsistence Fishery

The earliest fisheries for groundfish in the GOA were the native subsistence fisheries. The coastal native peoples of Alaska have historically relied heavily upon marine resources for their subsistence. The Aleuts and Koniags utilized not only marine mammals and salmon extensively, but also other fish species such as halibut, cod, flounders, greenling, and smelt. Collins (1945) described the jig fishery for Atka mackerel in inshore waters, the drying of capelin and the taking of sculpins for human consumption. Halibut, turbot, and cod were fished in depths to 60 fathoms using line made of sinew or kelp, V-shaped wooden and bone hooks, floats of carved wood or inflated seal stomachs, and stone anchors (Hrdlicka, 1945). Clark (1974) and DeLaguna (1964) describe the use of similar techniques in the Kodiak and Yakutat areas, respectively. In addition to salmon, the Tlingit and Haida of the Yakutat and Southeastern areas of Alaska relied most heavily upon halibut, herring, and smelt. In the early protohistoric period, much of the fish was eaten raw or boiled or broiled, cod being one species which was always cooked before consumption.

Today, the use of fish for subsistence, with the exception of salmon and halibut, is considerably less than during the period prior to the establishment of local retail stores and easily accessible packaged foods. Of the groundfish species, cod and rockfish are the most extensively utilized, with flounders and greenling as lesser contributors. Southcentral Alaska has a much lower level of subsistence use than other areas of the GOA (NMFS 2004).

Subsistence resource use by residents of groundfish communities in the Alaska Peninsula and Aleutian Islands (Unalaska, Akutan, Sand Point, and King Cove) ranges from about 200 to over 450 pounds per capita. Groundfish ranges from about 4 to 9 percent of total subsistence resource consumption, primarily cod and rockfish. Residents of the City of Kodiak are reported to harvest and consume about 151 pounds of subsistence resource per capita, and groundfish average about 8 percent of the total per capita subsistence consumption (12 pounds per capita), with cod, rockfish, and greenling as primary species. In Southeast Alaska, specifically the communities of Petersburg, Sitka, and Yakutat, total subsistence resource consumption ranges between about 200 and 400 pounds per capita, with groundfish ranging between 1 and 5 percent of the total annual consumption, and the primary speecies flounder, cod, rockfish, and greenling (NMFS 2004).

4.3.4 Recreational Fishery

In most areas of the state, groundfish, except rockfish, are not highly regarded as sportfish. Relatively minor recreational fisheries for flounder, Pacific cod, and greenling exist near coastal population centers. However, these fisheries account for very few recreational fishing days when compared with the primary sport fisheries for salmon, steelhead trout, chars, and halibut.

Based upon Alaska Department of Fish and Game Sport Fish Division data, it appears that recreational use of rockfish and Pacific cod accounted for 4 percent of all sport fish harvest in Alaska in 2000 , the latest data currently available. Rockfish made up the majority of this catch with 131,628 fish harvested, and 4,605 of Pacific cod. In the same year, halibut sport landings, statewide, were estimated at 403,280 fish, approximately 12 percent of total harvest (the amount of halibut harvested by sport fishing was the third largest in 2000, after coho and sockeye salmon) (Walker *et al.* 2003).

Recreational use of groundfish has increased since 1990, when rockfish harvest represented only 2 percent of total Alaska sportfish harvest. Virtually all of the sport catch is taken in the Southeast and Southcentral

regions of the state, and is associated with the larger population centers (Walker *et al.* 2003). However, although groundfish as a sport fish resource may be growing in importance, the volume of total harvest of groundfish in the recreational fishery is small in comparison to the directed commercial catch.

4.4 Economic and Socioeconomic Characteristics of the Fishery

This section contains a general discussion of the economic and socioeconomic characteristics of the commercial groundfish fisheries in the GOA. The information cited in this section is from the annually updated *Economic Status of the Groundfish Fisheries off Alaska* appendix to the SAFE (Hiatt *et al.* 2003). This document is available on the Council website, or by request from the Council office. The website address for the Council is included in Chapter 6.

Estimates of ex-vessel value by area, gear, type of vessel, and species, are included in the annual Economic Status appendix to the SAFE report. The ex-vessel value of the landings in the GOA groundfish fisheries, excluding the value added by at-sea processing, increased from $103.5 million in 1998 to$145.8 million in 2000, then decreased to $116.5 million in 2001 and increased to $137.3 million in 2002. The distribution of ex-vessel value by type of vessels differed by area, gear, and species. In 2002, catcher vessels accounted for 86 percent of the ex-vessel value of the groundfish landings compared to 72 percent of the total catch because catcher vessels take larger percentages of higher priced species such as sablefish, which was $2.15 per pound in 2002. Similarly, trawl gear accounted for only 32 percent of the total ex-vessel value compared to 78 percent of the catch because much of the trawl catch is of low-priced species such as pollock, which was about $0.11 per pound in 2002.

Residents of Alaska and of other states, particularly Washington and Oregon, are active participants in the GOA groundfish fisheries. For the GOA groundfish fisheries as a whole, 59 percent of the 2002 catch was made by vessels with owners who indicated that they were not residents of Alaska. Alaska vessels accounted for the majority of the Pacific cod catch. Vessels with owners who indicated that they were not residents of Alaska accounted for 48 percent of the 2002 ex-vessel value. Vessels owned by residents of Alaska accounted for a much larger share of the ex-vessel value than of catch (52 percent compared to 41 percent) because these vessels accounted for relatively large shares of the higher priced species such as sablefish.

Employment data for at-sea processors (but not including inshore processors) indicate that in 2002, the crew weeks totaled 5,287. The maximum monthly employment occurred in July.

There are a variety of at least partially external factors that affect the economic performance of the GOA groundfish fisheries. They include landing market prices in Japan, wholesale prices in Japan, U.S. imports of groundfish products, U.S. per capita consumption of seafood, U.S. consumer and producer price indexes, foreign exchange rates, and U.S. cold storage holdings of groundfish. Exchange rates and world supplies of fishery products play a major role in international trade. Exchange rates change rapidly and can significantly affect the economic status of the groundfish fisheries.

4.5 Fishing Communities

This section contains a general discussion of the fishing communities that depend on the commercial groundfish fisheries in the GOA. The information cited in this section is drawn from the *Final Programmatic Supplemental Environmental Impact Statement for the Alaska Groundfish Fisheries* (NMFS 2004). This document is available on the NMFS Alaska Region website, or by request from the NMFS Alaska Region

office. Other sources of information on GOA fishing communities are *Faces of the Fisheries*, a publication of community profiles by the Council (NPFMC 1994), and *Gulf of Alaska Coastal Communities: An Overview*, a report prepared by the Institute for Social and Economic Research (ISER) for the Gulf of Alaska Coastal Communities Coalition (ISER 1999).

Fishing communities in the Gulf of Alaska are shown in Figure 4-2. Kodiak is the dominant GOA fishing community for groundfish, and as a result, it is discussed independently in Section 4.5.1. Sections 4.5.2, 4.5.3, and 4.5.4 address major groundfish communities in the Eastern, Central, and Western regulatory areas. The FMP was amended in 2003 to allow certain small and isolated communities to purchase sablefish IFQ; these communities are discussed in Section 4.5.5.

Figure 4-2 Gulf of Alaska fishing communities. NOTE: Not all communities represented.

4.5.1 Kodiak

Kodiak is the dominant GOA fishing community for groundfish, and is important for salmon, halibut, and other species. In 2001, the region accounted for about 10 percent of the volume and about 13 percent of the value of the total groundfish processed in Alaska. The region accounted for almost 16 percent of the volume of groundfish processed inshore in all regions of the state (1992-2000). This volume included 11 percent of the pollock, 28 percent of the Pacific cod, 54 percent of the flatfish, and 30 percent of the combined Atka mackerel, rockfish, sablefish, and other groundfish category of groundfish processed. The City of Kodiak is the location of virtually all of the direct links with the commercial groundfish fishery within the region.

Kodiak groundfish processing began with the domestication of the groundfish fisheries. Prior to 1988, groundfish was processed aboard foreign vessels. The first surimi production in Alaska took place in Kodiak in 1985. According to the City of Kodiak, Kodiak is currently home port to 770 commercial fishing vessels, making it the state's "largest fishing port". The development or evolution of the Kodiak harvesting fleet has essentially paralleled that of the processors to which they deliver (along with the development of a fleet component that in part or in whole participates in BSAI fisheries).

The City of Kodiak has become the hub community of the region, at present comprising just less than 50 percent of the total Kodiak Island Borough population. Furthermore, a significant part of the region's population lives very near Kodiak in unincorporated areas, so that at present, approximately 85 percent of the Kodiak Island Borough population lives in and around the City of Kodiak. In terms of ethnicity, the city

is about 13 percent Native, while organized communities outside the city are predominantly Native (68 to 94 percent). The predominant minority in the city and its surroundings is Asian and Pacific Islanders, followed by Natives and Blacks. The economy of the City of Kodiak is dependent on fishing, and groundfish are an important component of this dependence. The fishing sector provides an important base for the retail and government sectors, which follow it in relative size. The military sector is also significant, and is actually second in income and earnings, primarily because of a local Coast Guard base, the largest in the country.

In recent years, groundfish has made up over 70 percent by weight of the fish processed in the Kodiak Island region. In 2001, pollock comprised about 43 percent of the groundfish by volume, followed by Pacific cod at about 29 percent. Although Kodiak residents own both onshore and offshore processing facilities, onshore plants that process pollock and Pacific cod are owned predominantly by entities outside the region (1995 to present). Kodiak residents are active in the ownership of offshore processing vessels for groundfish other than pollock. Residents historically have owned three to six offshore processing facilities, with the lower numbers in earlier years. In 2001, catcher-processors owned by regional residents had a wholesale product value of $23.6 million, and shoreplants had an analogous figure of $2.8 million.

The Kodiak-owned catcher vessel fleet is very diverse. Some vessel classes, especially the larger trawl vessels, have displayed remarkable stability over time. Smaller trawlers have become fewer. Fixed gear vessels have increased in number. Most of the fleet's fishing activity is in the central GOA, and product is delivered to Kodiak shoreplants. Regional vessel ownership is heavily concentrated in the City of Kodiak. Since 1991, catcher vessels owned by Kodiak residents have harvested a significant amount of fish in the Bering Sea as well. In 2001, the central GOA accounted for 57 percent of ex-vessel value, and the Bering Sea accounted for 27 percent. Pacific cod accounted for 25 percent by volume and 45 percent by value of retained groundfish harvest, while pollock accounted for 60 percent of volume and 29 percent by value in 2001.

Residents of the City of Kodiak are reported to harvest and consume about 151 pounds of subsistence resource per capita, of which 72 percent is fish. However, groundfish comprise only about 8 percent of the total (12 pounds per capita).

4.5.2 Eastern Regulatory Area Communities - Petersburg, Sitka, and Yakutat

The top three Southeast Alaska region ports account for almost all of the region's reported processing. In alphabetical order, they are Petersburg, Sitka, and Yakutat. All three communities support diverse fisheries, pursued by fishers participating in multiple fisheries. Of most importance are salmon and halibut. The main groundfish fisheries are rockfish and sablefish.

The economy of Petersburg historically has been based on commercial fishing and timber harvests. Alaska's first shrimp processor, Alaska Glacier Seafoods, was founded in 1916. The cannery has operated continuously since its founding, and is now known as Petersburg Fisheries, a subsidiary of Icicle Seafoods, Inc. Petersburg has developed into one of Alaska's major fishing communities with the largest home-based halibut fleet in Alaska, but landings of shrimp, crab, salmon, herring and other fish are also locally important. Several processors operate cold storage, canneries and custom packing services, employing over 1,100 people during the peak season.

Sitka is one of the oldest communities in Alaska. In 1878 one of the first canneries in Alaska was built in Sitka. The city is home to a sizable fishing fleet, a U.S. Coast Guard Air Station, which handles marine search-and-rescue missions, a campus of University of Alaska Southeast and the private Sheldon Jackson College. The economy is diversified with fishing, fish processing, tourism, government, transportation, retail, and health care services. Sitka is a port of call for many cruise ships each summer and fish processing provides seasonal employment.

The city of Yakutat was formed in 1948, but in 1992, the city was dissolved and a borough was organized. Fishing and subsistence activities are prevalent, and Yakutat's economy depends on fishing, fish processing and government employment. A cold-storage plant is the major private employer, although lodges and fishing charters in the Situk River drainage provide some jobs. Subsistence hunting and fishing activities focus on salmon, trout, shellfish, deer, moose, seals, bears and goats.

Among the important processing communities, Petersburg, Yakutat, and Sitka all display different patterns. In Sitka and Petersburg, Caucasians are the great majority of the population (74 and 87 percent, respectively), with Alaska Natives at 21 and 10 percent, respectively. Yakutat is 55 percent Native and 43 percent Caucasian. This overall population composition reflects the general identity or 'character' of each community, as the contemporary demographics of Petersburg highlights its Norwegian fishing history, Sitka its diverse Native/Russian-American history, and Yakutat its Native heritage. Fisheries in general, and groundfish fisheries in particular, are relatively small contributors to Southeast Alaska region employment, especially compared to the government, services, and retail sectors, although fishing and fish processing are more important for the three communities than the region as a whole. There are fewer overall economic opportunities in Yakutat compared to the other two communities.

Most Southeast Alaska regional groundfish processing occurs in Petersburg, Sitka, and Yakutat. These communities differ in the degree to which they participate in groundfish fisheries and in the mix of species that they exploit. Of greatest significance regionally among groundfish is the combined category that lumps Atka mackerel, rockfish, sablefish, and "other" (non-pollock, non-cod, and non-flatfish) groundfish. Most of the active processors in this region use groundfish only as a supplementary product acquired as bycatch. Rockfish are targeted only sometimes as a primary product, and total volume is still low. The groundfish fishery is important for components of the local fleet, but serves a secondary role for most processors. For the most part, Southeast regional processors tend to concentrate on higher-value, low-volume species such as sablefish and rockfish that are typically sold whole or as headed and gutted product. In 2001, the combined category accounted for 94 percent of the volume and over 99 percent of the value of all groundfish processed in the region.

Ownership patterns for catcher vessels are much the same as for processors, in that they indicate a fishery more dependent on limited quantities of Pacific cod, rockfish, and sablefish pursued with longline gear rather than higher volumes of fish pursued with trawl gear. Most locally owned vessels are relatively small and use longline gear for groundfish (and probably participate in other fisheries). Sitka, Petersburg, and Juneau are the most important communities in terms of regional vessel ownership. Over the 1992-2000 period, Sitka vessels accounted for 30 percent of the value of the groundfish landed by the regionally owned fleet, and for 29 percent of the vessels in that fleet. Petersburg residents accounted for 17 percent of the value and 16 percent of the regionally owned fleet, while Juneau residents owned 13 percent of both value and vessels during this period. In 2001, 74 percent of the harvest value came from the eastern GOA, and 20 percent from the central GOA. The local fleet is a multi-species, multi-gear fleet concentrated in Sitka and Petersburg. For groundfish, the fleet targets sablefish and rockfish. Thus, most of the Pacific cod and pollock processed by the region's shoreplants is harvested and delivered by non-local vessels.

Subsistence utilization in the regionally important groundfish communities of Petersburg, Sitka, and Yakutat ranges between about 200 and 400 pounds per capita. Groundfish represents 1 to 5 percent of the total subsistence resources consumed.

4.5.3 Central Regulatory Area Communities - Cordova, Homer, Nikiski, and Seward

Participation in the groundfish fishery in Southcentral Alaska varies considerably from other Alaska regions. In addition to spanning the most heavily populated area of the state, the region also differs from the others

by virtue of its connection of communities and ports by a road system. This, in turn, influences the nature of engagement with the groundfish fishery. Homer and Seward serve as the primary ports for groundfish trucked on the Alaska road system. Cordova, Nikiski, and Seward accounted for the majority of processing through 2001, however the recent situation is somewhat fluid, as Steller sea lion protection measures may have already had significant effects on the groundfish (and especially pollock) fisheries that exist in the region.

Cordova, arguably Southcentral's most fishery- dependent community, has its origins in transportation as well as fishing. In Homer, sport fishing for halibut and salmon contributes significantly to the economy along with the commercial fisheries. A total of 541 area residents hold commercial fishing permits. In 2000, the estimated gross fishing earnings of residents neared $27 million. The fish dock is equipped with cold storage facilities, ice manufacturing and a vacuum fish-loading system. Nikiski, now important as a landing/processing/shipping location for the groundfish fishery does not have the type of historical ties to commercial fisheries seen in a number of the other communities. As an ice-free harbor, Seward has become an important supply center for Interior Alaska. At the southern terminus of the Alaska Railroad, Seward has been a transportation hub for decades. The economy also includes tourism, commercial fishing, ship services and repairs, oil and gas development, a coal export facility, a state prison and the University of Alaska's Institute of Marine Services.

The groundfish processed in the region in 1999 accounted for less than two percent of the groundfish processed inshore in all Alaska regions. The combined Atka mackerel, rockfish, sablefish, and other groundfish category accounted for 43 percent of the volume reported over the period 1991-1998, and Pacific cod and pollock accounted for 35 and 17 percent of the total, respectively. The economies of the Southcentral Alaska region groundfish communities tend to be more diversified than those of the Alaska Peninsula/Aleutian Islands or Kodiak Island regions, and groundfish are of lesser importance for employment and income to the region in absolute and relative terms. In 2001, 18,000 tons with a wholesale value of $25 million were reported for regionally owned processors. Of the total value, $20 million came from shoreplants and $5 million from catcher-processors.

Fixed gear catcher vessels predominate, and since 1995, five or fewer trawl vessels have been locally owned. In the fixed gear vessel class, smaller vessel classes predominate by a large margin. This pattern is due, in part, to the relatively small scale of fisheries (and processing capacity) in the Southcentral Alaska region, the diversified nature of the fisheries pursued, and the presence of relatively sheltered waters. Ownership of vessels is spread through numerous communities in the region, but (in order of importance) Homer, Anchorage, Cordova, and Seward combined accounted for 63 percent of the total number of regionally owned vessels between 1992 and 2000, and these vessels, in turn, accounted for 73 percent of the ex-vessel value accrued by regionally owned vessels over this same period. In 2001, 67 percent of value came from the central GOA, 14 percent came from the western GOA and 10 percent come from the Bering Sea. In 2001, for retained harvest, 49 percent of volume and 44 percent of value came from Pacific cod, while the combined Atka mackerel, rockfish, sablefish, and other groundfish category accounted for 11 percent of volume and 47 percent of value.

Until May 2000, Homer, Kenai, and Seward were not classified as subsistence communities. For Cordova, groundfish are reported as approximately 4 percent (7 pounds per capita) of the total subsistence consumption (179 pounds per person per year).

4.5.4 Western Regulatory Area Communities - Dutch Harbor/Unalaska, Akutan, King Cove, Sand Point

The Alaska Peninsula/Aleutian Islands region is in several ways the center of the Alaska groundfish fishery in general, and the Bering Sea pollock fishery in particular. In 2001, the region accounted for about 88

percent by volume and 79 percent by value of all groundfish processed in Alaska. Unlike the rest of the GOA communities, most of the region's communities are primarily involved in the Bering Sea and Aleutian Islands fisheries, although there is participation in the GOA fisheries.

Unalaska/Dutch Harbor has been the number one fishing port in the United States in terms of volume of catch landed since 1992, and held the number one rank in value of catch landed from 1988 through 1999, slipping to number two in 2000 and 2001. Groundfish (especially pollock) is a central part of the community's fishery-based economy. Unalaska has extensive historical links to the groundfish fisheries, and over time, the level of activity associated with commercial fishing and fish processing has both increased and diversified, and is now the basis of the local economy. Large multi-species groundfish shore processing plants in the community include Alyeska, Unisea, and Westward. Royal Aleutian is a large crab processor, and Icicle brings significant processing capacity to the community in the form of mobile processing facilities.

Akutan has a large processing plant west of the village proper processes significant quantities of groundfish as well as crab. The processing plant supplies the community with substantial economic benefit, but large-scale commercial fishing activity is largely not integrated with the daily life of the community. The Trident plant is the principal facility in the Akutan port and, historically, a number of smaller, mobile processing vessels have operated seasonally out of the port of Akutan.

King Cove is historically a commercial fishing community. King Cove has had processing facilities as part of the community for decades and resident commercial fishing fleets that deliver to local seafood processors with longstanding relationships. Local fishermen traditionally have fished for all major species, including groundfish, herring, crab and salmon, with crab and salmon predominant. Groundfish has gained importance in recent years, with Peter Pan Seafoods Inc. plant qualifying as an AFA facility.

Sand Point, like King Cove, has had processing facilities as part of the community for decades and resident commercial fishing fleets that deliver to local seafood processors with longstanding relationships. It is home to the largest fishing fleet in the Aleutian Chain. Trident operates the current processing plant, processing cod, black cod, halibut, pollock, salmon and other assorted bottomfish. Peter Pan Seafoods Inc. operates a support station in Sand Point for their processing plant in King Cove.

Unalaska (population 4,283 in 2000) is the largest community in the region. Of the other four communities with more than 200 residents in 2000, three (Akutan [population 713], King Cove [population 792], and Sand Point [population 842, the second largest community in the region]) are substantially involved with the groundfish fishery and are the sites of large processing facilities. Communities have a wide range of employment opportunities that are closely related to the commercial fishery in general, and the groundfish fishery in particular. Processing workers tend to be in the community because of the employment opportunity, tend to leave when employment terminates, and comprise a significant portion of the population.

In the Alaska Peninsula/Aleutian Islands region in 2001, pollock comprised more than 93 percent of the groundfish volume processed, and Pacific cod 5 percent. Pollock accounted for 88 percent of processed product value, and Pacific cod 10 percent. Of the large groundfish processors in the region, six focus on Bering Sea groundfish; the others include the plants in Sand Point and King Cove, among others. The Bering Sea plants dominate processing in the region (and, indeed, the state) in terms of volume of groundfish processed. In 2000, eight non-Bering Sea pollock sector plants reported processing groundfish in Adak (1), Chignik (1), Unalaska/Dutch Harbor (3), King Cove (1), Sand Point (1), and St. Paul (1).

Catcher vessel ownership within the region is strongly clustered in Sand Point and King Cove, with a secondary cluster in Unalaska. King Cove residents owned 24 percent of the vessels that, in turn, accounted for 23 percent of the regionally owned vessel landings value over this same period. In 2001, 90 percent of

the retained harvest value from these vessels came from the western GOA FMP area. About 34 percent retained harvest volume was Pacific cod, and 64 percent was pollock. For that same year, Pacific cod accounted for 66 percent of total groundfish value, and pollock 33 percent.

Akutan, King Cove, Sand Point, and Unalaska have a subsistence resource consumption ranging from about 200 pounds per capita to more than 450 pounds per capita. Of this total, groundfish specifically ranges from 4 to 9 percent of the total.

4.5.5 Communities Eligible for the Sablefish IFQ Community Quota Purchase Program

Table 4-7 lists the 42 GOA coastal communities that are eligible to purchase sablefish quota share under the community quota purchase program. The criteria require the communities to have populations of no greater than 1,500, no road access to larger communities, direct access to saltwater, and documented historic participation in the halibut or sablefish fisheries. The criteria for this program is intended to target a subset of GOA communities that need expanded economic opportunities and assistance in continuing long-term participation in the commercial halibut and sablefish fisheries. The criteria effectively limit eligibility to communities that received very little quota share in the initial allocation and are struggling to remain economically viable. These communities were evaluated as part of Amendment 66 to the GOA FMP (NPFMC 2002), and are all considered fishery-dependent to varying degrees. A National Resource Council (NRC) report notes on the issue of fishing-dependent communities, that for small, isolated communities such as many of those in Alaska: "the notion of dependency may include geographic isolation; lack of employment alternatives; social, economic, and cultural systems that have developed in these locations; and their dependence on fishing as a source of nutrition, livelihood, and life-style" (NRC 1999, p. 19). The NRC report notes that fishing may be used as part of a diverse set of lifestyles, so the fact that these communities differ means only that they are dependent on fishing in different ways related to their social, cultural, and economic systems.

Most of these communities rely on subsistence fishing and hunting, as documented by the State of Alaska, either as a primary food source or to supplement other sources. The dominant subsistence species harvested are halibut, salmon, shrimp, crab, and clams. For some communities, including Kasaan, Akhiok, Larsen Bay, Old Harbor, Port Lions, Ivanof Bay, Yakutat, and the Chignik area, the majority of the residents continue to participate in subsistence fishing (and hunting) activities. Subsistence fishing does not appear to be of high importance for a few communities that have alternative income sources, including Hollis (which relies mostly on logging) and Halibut Cove (primarily an artist community), Pelican, Port Graham, and Seldovia. The level of reliance on the fishing industry varies by community, but because of the limited economic opportunities in these smaller, remote communities, fishing, whether commercial or subsistence, represents a significant factor in the overall economy.

The broad conclusion gathered from collective sources is that fishing plays a role in the identity of all of the proposed communities – nearly all of the communities are reliant on subsistence harvests, and commercial fishing, whether for sablefish, halibut, or otherwise, is the dominant source of jobs and income in most of these communities.

The analysis in NPFMC (2002) shows that most of these communities have a significant portion of their population living at or below the poverty level and relatively high unemployment levels, compared to the State of Alaska as a whole. The State-wide unemployment rate reported by the Alaska Department of Labor in August 2000 was 6.3 percent. The Kenai Borough, in which most of the Central area communities are located, reported an average unemployment rate of 10.2 percent for the year 2000. Of the 14 eligible communities in the Central area, all but 3 reported higher unemployment rates than the State average, and 8 were higher than the average of the Kenai Peninsula Borough. Likewise, although none of the eligible

Eastern area communities are located within an organized borough, the nearby Skagway-Hoonah-Angoon census area reported an unemployment rate of 9.4 percent in 2000. Seventeen of the 21 eligible communities in Area 2C reported higher unemployment rates than the State average and 14 reported higher than the Skagway-Hoonah-Angoon area average. In the Western area, only 2 of the 7 target communities fall below the State unemployment average. Five of these communities are in the Lake and Peninsula Borough, which had an average unemployment rate of 10.1 percent in 2000. Of the 5 eligible communities located in that borough, two reported higher 2000 unemployment rates than the borough's 2000 average. The remaining 2 Western area communities are in the Aleutians East Borough, which had an average unemployment rate of 4.6 percent in 2000. Both communities reported higher rates than the borough overall.

Table 4-7 Communities eligible for the sablefish IFQ community quota share purchase program

Eastern regulatory area		Central regulatory area		Western regulatory area
Angoon	Klawock	Akhiok	Ouzinkie	Chignik
Coffman Cove	Metlakatla	Chenega Bay	Port Graham	Chignik Lagoon
Craig	Meyers Chuck	Halibut Cove	Port Lions	Chignik Lake
Edna Bay	Pelican	Karluk	Seldovia	Ivanof Bay
Elfin Cove	Point Baker	Larsen Bay	Tatitlek	King Cove
Gustavus	Port Alexander	Nanwalek	Tyonek	Perryville
Hollis	Port Protection	Old Harbor	Yakutat	Sand Point
Hoonah	Tenakee Springs			
Hydaburg	Thorne Bay			
Kake	Whale Pass			
Kassan				

4.6 Ecosystem Characteristics

Ecosystem characteristics of the Gulf of Alaska are assessed annually in the *Ecosystem Considerations* appendix to the *Bering Sea and Aleutian Islands and Gulf of Alaska Stock Assessment and Fishery Evaluation*. Since 1995, this document has been prepared in order to provide information about the effects of fishing from an ecosystem perspective, and the effects of environmental change on fish stocks. Since 1999, the section has included information on indicators of ecosystem status and trends, and more ecosystem-based management performance measures.

Since 2003, an annual Ecosystem Assessment has also been included in the appendix to the SAFE. The primary intent of the assessment is to summarize historical climate and fishing effects of the shelf and slope regions of the eastern Bering Sea and Aleutian Islands, and Gulf of Alaska, from an ecosystem perspective and to provide an assessment of the possible future effects of climate and fishing on ecosystem structure and function. The *Ecosystem Considerations* sections from 2000 to the present are available online at www.afsc.noaa.gov/refm/reem/Assess/Default.htm or by request from the Council office.

4.6.1 Ecosystem Trends in the Gulf of Alaska Management Area

This section is drawn from the *Final Programmatic Supplemental Environmental Impact Statement for the Alaska Groundfish Fisheries* (PSEIS) (NMFS 2004), available on the NMFS Alaska Region website (www.fakr.noaa.gov), or by request from the NMFS Alaska Region office.

Mueter (1999) examined GOA groundfish communities using groundfish and shrimp trawl data collected over several years from the eastern and western GOA. To identify spatial and temporal patterns in community structure, the data were analyzed for species richness, diversity, total abundance, and indices of species composition in relation to depth, temperature, salinity, sediment composition, geographic location, and time of sampling. The data were then compared to local and larger scale atmospheric and oceanographic changes.

In general, species richness and diversity peaked at water depths of about 200-300 m in the GOA. Higher abundance, lower species richness and diversity, and a different species composition of demersal fishes were found in the western GOA as compared to the eastern GOA. Mueter concluded that these large-scale spatial patterns were related to upwelling differences between the two regions.

With respect to long-term trends, the lowest species richness (number of species per haul) was observed in 1984, whereas the lowest species diversity (as measured by the Shannon-Wiener diversity index) was seen in 1996. It is difficult to tell whether these trends are real because of changes in trawl survey techniques and gear usage during the 12-year sample period. General increases in total groundfish biomass were seen from 1984 to 1996 (Figure 4-3), coupled with statistically significant changes in species composition (Figure 4-4). Community structure in nearshore areas around Kodiak Island changed during this same period, with decreasing populations of shrimp and small forage fish and increasing populations of large, fish-eating species such as Pacific cod and flatfish.

Mueter found that the total biomass of commercially-fished species in shelf and slope areas had increased since 1984, despite a considerable, concurrent increase in harvest effort. At the same time, the abundances of unexploited (or underexploited) species including skate, some shark species, forage species, arrowtooth flounder, and other flatfish had increased (Figure 4-5). Populations of an overexploited species, the Pacific ocean perch, had also rebounded from low population levels. The controlling factor for these increases appeared to be environmental, with changes in community species composition in nearshore areas linked to an increase in advection in the Alaska Coastal Current. Mueter concluded that increased flow around the GOA may have enhanced the supply of nutrients and plankton on the shelf and upper slope areas, resulting in higher productivity.

In addition to Mueter's work, studies by Piatt and Anderson (1996), Anderson and Piatt (1999), Orensanz *et al.* (1998), Robards *et al.* (1999) and others, discussed in Section 3.10.1.5 of the PSEIS, provide evidence that physical oceanographic factors, particularly climate, have a controlling influence on biological community composition in the BSAI and GOA. An important conclusion to be drawn from these studies is that any effects of human activities on the marine environment should be considered in the context of the powerful physical forces that appear to be driving the BSAI and GOA ecosystems.

Figure 4-3 Estimated trend in the combined catch per unit of effort of 72 groundfish taxa from 1984-1996, averaged over Gulf of Alaska shelf and upper slope to 500 meters.

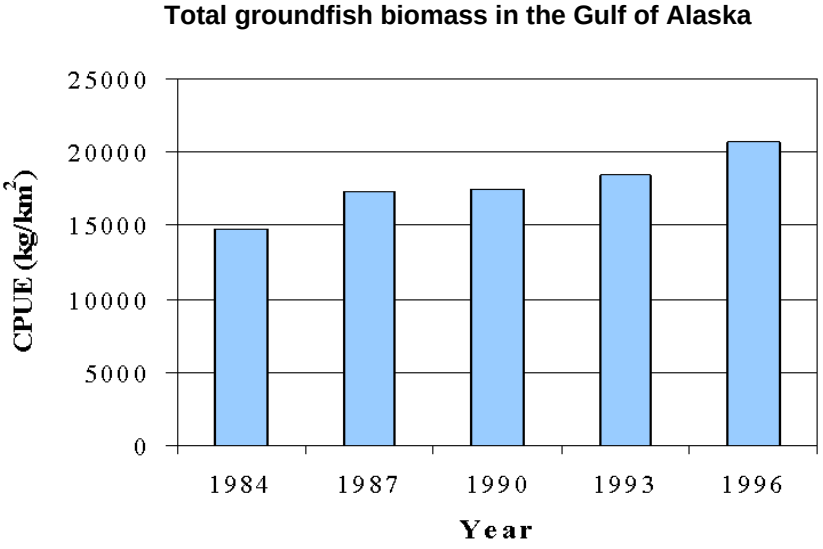


Figure 4-4 Trend index of species composition based on ordination of species abundance data from five triennial surveys on Gulf of Alaska shelf and slope with approximate 95 percent confidence interval. Source: NMFS.

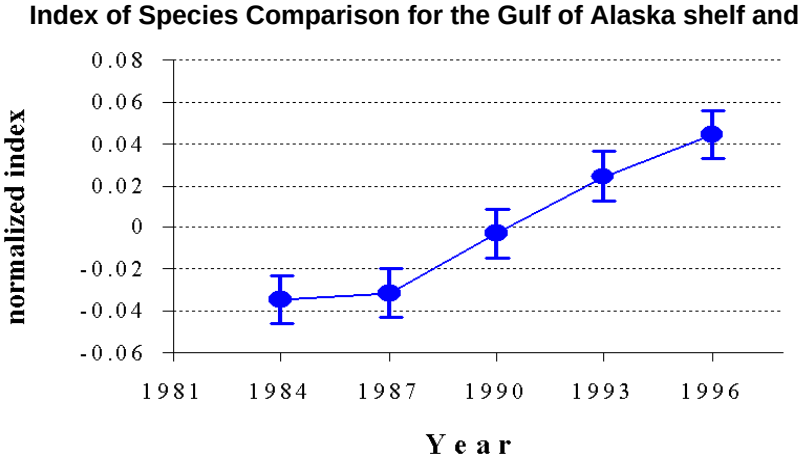
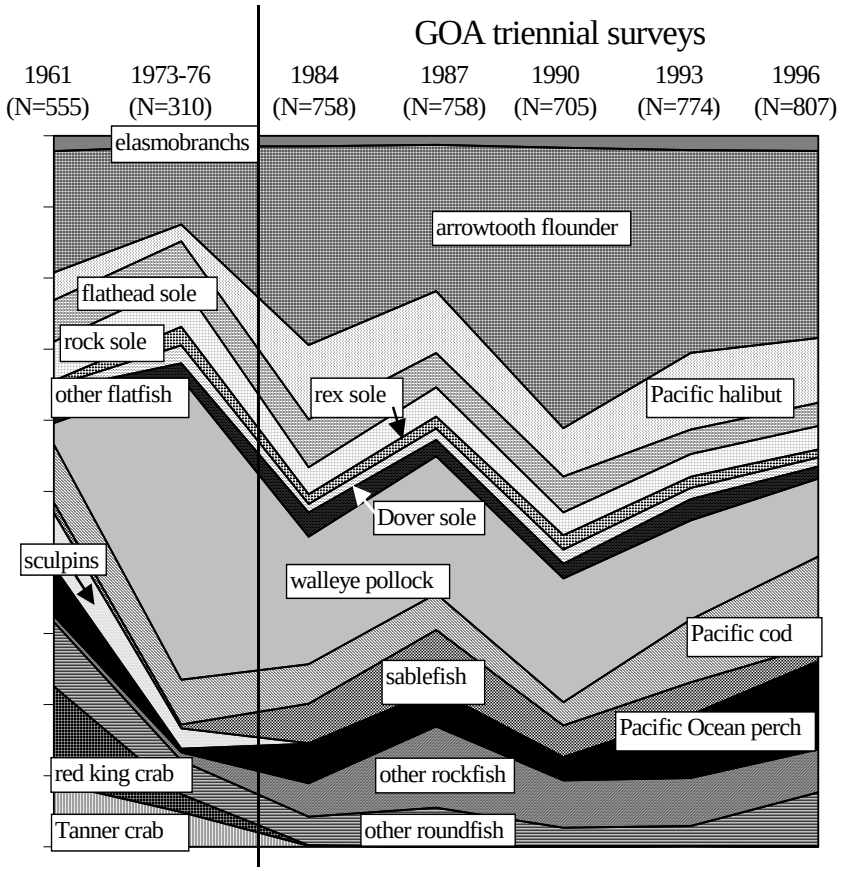


Figure 4-5 Relative species composition for major groundfish taxa in the Gulf of Alaska from 1961 through 1996. Source: NMFS.



4.6.2 Climate-Implicated Change

This section is drawn from the *Final Programmatic Supplemental Environmental Impact Statement for the Alaska Groundfish Fisheries* (NMFS 2004), available on the NMFS Alaska Region website (www.fakr.noaa.gov), or by request from the NMFS Alaska Region office.

Evidence from observations during the past two decades and the results of modeling studies using historical and recent data from the North Pacific Ocean suggest that physical oceanographic processes, particularly climatic regime shifts, might be driving ecosystem-level changes that have been observed in the BSAI and GOA. Commercial fishing has not been largely implicated in BSAI and GOA ecosystem changes, but studies of other ecosystems with much larger fishing pressures indicate that fishing, in combination with climate change, can alter ecosystem species composition and productivity (Jennings and Kaiser 1998, Livingston and Tjelmeland 2000).

During 1997 and 1998, a period of warmer-than-usual ambient air temperatures (Hare and Mantua 2000), a number of unusual species occurrences were observed in the BSAI and GOA, including the following examples:

- In 1998, several warm-water fish species, including Pacific barracuda (*Sphyraena argentea*), were observed and/or caught in the GOA. Ocean sunfish (*Mola mola*) and chub mackerel (*Scomber japonicus*), occasionally recorded in southeast Alaskan waters, were documented there in unusually large numbers. Similarly, Pacific sleeper sharks (*Somniosus pacificus*) were caught (and released) in higher than normal levels in Cook Inlet, and salmon sharks (*Lamna ditropis*) were taken in fairly large numbers off Afognak Island (Kevin Brennan, ADF&G, personal communication).

- Spiny dogfish (*Squalus acanthias*) substantially increased in the Kodiak area and in Prince William Sound (Bill Bechtol and Dave Jackson, ADF&G, personal communication). In 1998, this species' inclusion in collection tows increased by more than 40 percent. A corresponding increase in spiny dogfish has been observed in the International Pacific Halibut Commission's GOA halibut longline bycatch surveys (Lee Hulbert, NMFS, personal communication).

- Individuals of several marine mammal species were seen at unusual times and/or places during 1998, including a Pacific white-sided dolphin (*Lagenorhynchus obliquidens*) near Haines and a northern right whale (*Eubalaena glacialis*) off Kodiak Island.

- Unusual bird sightings in the GOA included a gray-tailed tattler (*Heteroscelus brevipes*) south of the Kenai Peninsula and a mallard (*Anas platyrhynchos*) several miles offshore in the open ocean. Common murre (*Uria aalge*) die-offs were reported in Cook Inlet, Kodiak, the eastern Aleutians, Resurrection Bay, and the eastern Bering Sea.

- Three northern elephant seals (*Mirounga angustirostris)* were spotted in nearshore waters around Unalaska during late June and early July, whereas they are usually found farther offshore and at a different time of year.

- There were poor returns of chinook (*Oncorhynchus tshawytscha*) and sockeye (*Oncorhynchus nerka*) salmon to Bristol Bay during both years.

Research on climate shifts as a forcing agent on species and community structure of the North Pacific Ocean can be found in Francis and Hare (1994), Klyashtorin (1998), McGowan *et al.* (1998), Hollowed *et al.* (1998), and Hare and Mantua (2000). The approach used in these studies assesses correlations between past climatic

patterns and changes in biomass or recruitment rate for particular marine species. Because cause-and-effect relationships between temporal and spatial patterns of climate change and corresponding patterns of change in biological populations have not been proven for the BSAI and GOA, the correlations must be considered circumstantial. But there are reasons to expect that causal links do exist. For example, stronger recruitment would be expected under more favorable climatic conditions, because more juveniles would be likely to survive to adulthood, whereas harsh conditions would result in weak recruitment because fewer juveniles would survive. In both cases, the recruitment patterns would be reflected in the strength or weakness of the affected age groups within future fisheries.

Francis and Hare (1994) analyzed historical data supporting a climate shift that caused a precipitous decline in the sardine (*Sardinops sagax*) population off Monterey, California in the 1950s. Although it had been widely concluded that this decline resulted solely from overfishing, the data indicate instead that a change in sea surface temperature was closely correlated with the sardines' disappearance, and this related closely to patterns of sardine numbers in marine sediments off Southern California. Consequently, both climate and fishing are now recognized to be implicated in the sardine population decline.

Francis and Hare (1994) related the intensity of the Aleutian low pressure system (Aleutian low), a weather pattern, with production of salmon and zooplankton. Winter ambient air temperatures at Kodiak and the North Pacific Index, an index tracking the intensity of the Aleutian low during the winter, were used as indicators of climatic severity. Strong correlations were found between long-term climatic trends and Alaskan salmon production. Annual weather patterns were found to be closely correlated with changes in zooplankton populations.

For the northeastern North Pacific Ocean, McGowan *et al.* (1998) showed that interannual climatic variations linked to the El Niño-Southern Oscillation (ENSO) and decadal-scale climate shifts can be detected in physical oceanographic data. For instance, the depth of the mixed layer in the California Current and GOA became shallower over time, whereas the mixed-layer depth in the Central Pacific deepened during the same period. This was not, however, reflected in the mass flow of the California Current. Greater depth of the mixed layer during elevated sea surface temperature events was correlated with decreased nutrient availability, plankton abundance, and shifts in community structure. These researchers concluded that climatic events such as ENSO are correlated with changes in biological populations associated with the California Current. Biological processes in the GOA appear to be more strongly influenced by variations in the Aleutian low.

According to McGowan *et al.* (1998), climate-related changes in the biological communities of the California Current system ranged from declines in kelp forests to shifts in the total abundance and dominance of various zooplankton species. Some fish and invertebrate populations declined, and the distributional ranges of species shifted northward. In addition, seabird and marine mammal reproduction were apparently affected by ENSO conditions. Interdecadal changes in community structure also occurred, with intertidal communities becoming dominated by northward-moving southern species and changes in species proportions occurring in most other sectors of the ecosystem.

Interdecadal shifts observed in the northeastern North Pacific Ocean ecosystem have been of the opposite sign from those in the California Current system, with increases in zooplankton biomass and salmon landings observed in the GOA (McGowan *et al.* 1998, Francis and Hare 1994). These shifts have corresponded to the intensity and location of the winter mean Aleutian low, which changes on an interdecadal time scale.

Klyashtorin (1998) linked catch dynamics of Japanese sardines, California sardines, Peruvian sardines, Pacific salmon, Alaska pollock, and Chilean jack mackerel in the Pacific with an atmospheric circulation index that

shows trends similar to the North Pacific Index used by other researchers. Other species, such as Pacific herring and Peruvian anchovy, are negatively associated with this index.

Hollowed *et al.* (1998) analyzed oceanographic and climatic data from the eastern North Pacific Ocean and compared those data with information on recruitment for 23 species of groundfish and five non-salmonid species and with catch data for salmon. The fish recruitment data were compared to environmental factors over various time scales and with varying time lags. Hollowed *et al.* (1998) found that, for species such as pollock, cod, and hake, recruitment was generally stronger during ENSO events. Whereas salmon and large-mouthed flatfish such as arrowtooth flounder, Greenland turbot, and Pacific halibut responded more strongly to longer-term events such as decadal-scale climatic regime shifts. Because both ENSO and decadal-scale ecosystem shifts are environmentally controlled, the results of this analysis support climate change as an important controlling factor in ecosystem dynamics.

There is considerable evidence that decadal and basin-scale climatic variability (Section 3.3.4) can affect fish production and ecosystem dynamics. Sudden basin-wide shifts in climatic regime have been observed in the North Pacific Ocean (Mantua *et al.* 1997), apparently due to changes in atmospheric forcing. Eastward- and northward-propagating storm systems dominate the wind stress on surface waters for short periods (less than one month), mixing the upper layers and altering sea surface temperatures (Bond *et al.* 1994). Because fish are very sensitive to ambient water temperature, even changes in surface temperature, if sufficiently frequent or prolonged, can alter fish distribution and reproductive success as well as recruitment (the number of juveniles that survive to enter the adult, reproducing portion of the population).

In a long-term trends analysis by computer, Ingraham and Ebbesmeyer (Ingraham *et al.* 1998) used the Ocean Surface Current Simulator model to simulate wind-driven surface drift trajectories initiated during winter months (December through February) for the period 1946 to present. The model-generated endpoints of the 3-month drift trajectories shifted in a bimodal pattern to the north and south around the mean. The winter flow during each year was persistent enough to result in a large displacement of surface mixed-layer water. The displacement also varied in a decadal pattern. Using the rule that the present mode is maintained until three concurrent years of the opposite mode occur, four alternating large-scale movements in surface waters were suggested: a southward mode from 1946 to 1956, a northward mode from 1957 to 1963, a southward mode from 1964 to 1974, and a northward mode from 1975 to 1994. As more northern surface water shifts southward, colder conditions prevail farther south, and as southward water moves northward, warmer conditions prevail farther north, both potentially affecting fish distribution and population dynamics.

Real-world evidence that atmospheric forcing alters sea surface temperatures comes from two principal sources: shorter-term ENSO events and longer-term Pacific Decadal Oscillations (Mantua *et al.* 1997). Temperature anomalies in the BSAI and GOA indicate a relatively warm period in the late 1950s, followed by cooling especially in the early 1970s, followed by a rapid temperature increase in the latter part of that decade. Since 1983, the BSAI and GOA have undergone different temperature changes. Sea surface temperatures in the BSAI have been below normal, whereas those in the GOA have been generally above normal. Consequently, the temperature difference between the two bodies of water has jumped from about 1.1° C to about 1.9° C (U.S. GLOBEC 1996).

Subsurface temperatures, potentially an even more important influence on biological processes, have been documented to change in response to climatic drivers. There was a warming trend in subsurface temperatures in the coastal GOA from the early 1970s into the 1980s similar to that observed in GOA sea surface waters (U.S. GLOBEC 1996).

In addition, seawater temperature changes in response to ENSO events occurred, especially at depth, in 1977, 1982, 1983, 1987, and in the 1990s. The 1997-1998 ENSO event, one of the strongest recorded in the

twentieth century, substantially changed the distribution of fish stocks off California, Oregon, Washington, and Alaska. The longer-term impacts of the 1997-1998 ENSO event remain to be seen. Francis *et al.* (1998) reviewed the documented ecological effects of this most recent regime shift through lower, secondary, and top trophic levels of the North Pacific Ocean marine ecosystem. Some of the following impacts on higher trophic levels are based on this review:

- Parker *et al.* (1995) demonstrated marked similarities between time series of the lunar nodal tidal cycle and recruitment patterns of Pacific halibut.

- Hollowed and Wooster (1995) examined time series of marine fish recruitment and observed that some marine fish stocks exhibited an apparent preference (measured by the probability of strong year and average production of recruits during the period) for a given climate regime.

- Hare and Francis (1995) found a striking similarity between large-scale atmospheric conditions and salmon production in Alaska.

- Quinn and Niebauer (1995) studied the Bering Sea pollock population and found that high recruitment coincided with years of warm ocean conditions (above normal air and bottom temperatures and reduced ice cover). This fit was improved by accounting for density-dependent processes.

Additional evidence of marine ecosystem impacts linked to climatic forcing comes from Piatt and Anderson (1996), who provided evidence of possible changes in prey abundance due to decadal-scale climate shifts. These authors examined relationships between significant declines in marine birds in the northern GOA during the past 20 years and found that statistically significant declines in common murre populations occurred from the mid- to late 1970s into the early 1990s. They also found a substantial alteration in the diet composition of five seabird species collected in the GOA from 1975 to 1978 and from 1988 to 1991, changing from a capelin-dominated diet in the late 1970s to a diet in which capelin was virtually absent in the later period.

The effects of ten-year regime shifts on the inshore GOA were analyzed using data from 1953 to 1997 (Anderson and Piatt 1999). Three taxonomic groups dominated (approximately 90 percent) the biomass of commercial catches during this period: shrimp, cod and pollock, and flatfish. When the Aleutian low was weak, resulting in colder water, shrimp dominated the catches. When the Aleutian low was strong, water temperatures were higher, and the catches were dominated by cod, pollock, and flatfish. Similar results were reported in very nearshore areas of lower Cook Inlet (Robards *et al.* 1999).

Few patterns were seen in the less-common species over the course of the study. Generally, the transitions in dominance lagged behind the shift in water temperature, strengthening the argument that the forcing agent was environmental. However, different species responded to the temperature shift with differing time lags. This was most evident for species at higher trophic levels, which are typically longer-lived and take longer to exhibit the effects of changes. The evidence suggests that the inshore community was reorganized following the 1977 climate regime shift. Although large fisheries for pandalid shrimp may have hastened the decline for some stocks (Orensanz *et al.* 1998), unfished or lightly fished shrimp stocks showed declines. Both Orensanz *et al.* (1998) and Anderson and Piatt (1999) concluded that the large geographic scale of the changes across so many taxa is a strong argument that climate change is responsible.

Other studies have linked production, recruitment, or biomass changes in the BSAI with climatic factors. For example, a climate regime shift that might have occurred around 1990 has been implicated in a large increase in gelatinous zooplankton in the BSAI (Brodeur *et al.* 1999). Recruitment in both crabs and groundfish in the

BSAI has been linked to climatic factors (Zheng and Kruse 1998, Rosenkranz *et al.* 1998, Hollowed *et al.* 1998, Hare and Mantua 2000).

There are indications from several studies that the BSAI ecosystem responds to decadal oscillations and atmospheric forcing, and that the 1976-1977 regime shift had pronounced effects. A peak in chlorophyll concentrations in the late 1970s was closely correlated with an increase in summer mixed-layer stability documented at that time (Sugimoto and Tadokoro 1997). Also, on a decadal time scale, chlorophyll concentrations in the summer were positively correlated with winter wind speeds, indicating a positive response of BSAI phytoplankton to stronger Aleutian lows (Sugimoto and Tadokoro 1997).

Evidence of biological responses to decadal-scale climate changes are also found in the coincidence of global fishery expansions or collapses of similar species complexes. Sudden climate shifts in 1923, 1947, and 1976 in the North Pacific Ocean substantially altered marine ecosystems off Japan, Hawaii, Alaska, California, and Peru. Sardine stocks off Japan, California, and Peru exhibited shifts in abundance that appear to be synchronized with shifts in climate (Kawasaki 1991). These historical 60-year cycles are seen in paleo-oceanographic records of scales of anchovies, sardines, and hake as well. Other examples are salmon stocks in the GOA and the California Current whose cycles are out of phase. When salmon stocks do well in the GOA, they do poorly in the California Current and vice-versa (Hare and Francis 1995, Mantua *et al.* 1997).

In addition to decadal-scale shifts, interannual events such as the ENSO can have significant impacts on fish distribution and survival, and can affect reproduction, recruitment, and other processes in ways that are not yet understood. This is particularly true for higher-latitude regions such as the northern California Current and GOA. As noted above, the 1997-1998 ENSO event significantly changed the distribution of fish stocks off California, Oregon, Washington, and Alaska. A change that has persisted to the present. Predicting the implications of this trend for future fishery management is problematic, in part because ENSO signals propagate from the tropics to high latitudes through the ocean as well as through the atmosphere, and it is difficult to separate these two modes of influence. Information on the dynamics of North Pacific Ocean climate and how this is linked to equatorial ENSO events is not adequate to adjust fisheries predictions for such abrupt, far-reaching, and persistent changes. Warm ocean conditions observed in the California Current during the present regime may be due, in large part, to the increased frequency of ENSO-like conditions.

In conclusion, evidence from past and present observations and modeling studies at the community and ecosystem levels for the BSAI and GOA suggest that climate-driven processes are responsible for a large proportion of the multi-species and ecosystem-level changes that have been documented. Modeling studies have been a valuable tool for elucidating the possible long-term implications of various fishing strategies. As with all computer-based models, these have been sensitive to unproven assumptions about recruitment and its relationship to climate. As the preceding discussion suggests, the models could be improved by incorporating components that include climatic effects on species, particularly with respect to recruitment. However, this approach has not been widely applied yet to species in the BSAI and GOA ecosystems.

4.6.3 Interactions Among Climate, Commercial Fishing, and Ecosystem Characteristics

This section is drawn from the *Final Programmatic Supplemental Environmental Impact Statement for the Alaska Groundfish Fisheries* (PSEIS) (NMFS 2004), available on the NMFS Alaska Region website (www.fakr.noaa.gov), or by request from the NMFS Alaska Region office.

Groundfish fishery management in the BSAI and GOA is implemented in a dynamic environment where both commercial fishing and climate-driven physical oceanographic processes interact in complex ways to affect the marine ecosystem. To characterize these interactions, it is necessary to distinguish, where feasible, the

separate effects of fishing and climate on biological populations. The following discussion reviews current knowledge regarding these effects and their relationship to ecosystem characteristics.

Three processes underlie the population structure of species in marine ecosystems: competition, predation, and environmental factors. Natural variations in the recruitment, survival, and growth of fish stocks are consequences of these processes. The first process, competition, is a basic concept underlying many ecological theories (e.g., Hairston *et al.* 1960, Welden and Slauson 1986, Yodzis 1978, 1994). It requires an assumption that species in an ecosystem are limited in their access to critical resources such as food, space, reproductive mates, and time for important activities. Predation is important, because it changes prey density, thereby directly or indirectly affecting populations throughout the ecosystem. Finally, environmental factors, particularly climatic processes, are thought to be major agents of change in North Pacific Ocean ecosystems. Climate has the potential to influence the important biological processes of reproduction, growth, consumption and predation, movement, and, ultimately, the survival of marine organisms.

Against this complex and dynamic natural background, human activities such as commercial fishing can influence the structure and function of marine ecosystems. Like competition, predation, and climate change, the effects of commercial fishing can extend over a range of temporal, spatial, and population scales. Large-scale commercial fishing has the potential to influence ecosystems in several ways. It may alter the amount and flow of energy in an ecosystem by removing energy and altering energetic pathways though the return of discards and fish processing offal back into the sea. The recipients, locations, and forms of this returned biomass may differ from those in an unfished system. In addition, the selective removal of species has the potential to change predator-prey relationships and community structures. Fishing gear may alter bottom habitat and damage benthic organisms and communities.

Both climate and commercial fishing activity currently influence the structure and function of the North Pacific Ocean ecosystem (Francis *et al.* 1999). Since climate change and commercial fishing can co-vary, it may be difficult to distinguish the impacts of the two (e.g., Trites *et al.* 1999). The primary way in which complex scientific knowledge is integrated to further the understanding of the influence of natural and human-related processes on marine ecosystems is through the use of models. Models can be as simple as conceptual diagrams that show a picture of how we think a certain ecosystem process operates, or they can be very complicated, with quantitative descriptions of the relationships between various factors and species growth, recruitment, movement, or survival. Reviews of the status of models that have been developed to understand the effects of climate and fishing on ecosystems have been produced by Livingston (1997) and Hollowed *et al.* (2000a). These reviews outline the types of models presently being used and the state of our ability to understand and predict the effects of the two important factors of climate and fishing in marine ecosystems by using models.

Most models that consider more than one species link the species together through knowledge about their feeding (trophic) interactions. Once the trophic linkages among species are understood, questions about impacts of predators and prey on one another (Yodzis 1994), or how natural or human-induced habitat changes affect the food-web structure (Yodzis 1996), can be addressed with a variety of multi-species or ecosystem models. Another model type, called a technical interaction model, may consider the simultaneous capture of groups of species by a particular fishery or type of fishing gear.

With the exception of information on forage fish, which – unlike many marine species – are preyed on as adults and not just mainly as juveniles, most scientific advice from multi-species models is not presently being used in making short-term management decisions. These models are mainly useful for trying to understand the possible medium- (6 to 10 years) and longer-term implications of various management strategies on the ecosystem.

However, long-term predictions from single-species, multi-species, and ecosystem-level models remain uncertain, because the predictions rely heavily on assumptions about recruitment, particularly for predators (Gislason 1991 and 1993), which may be strongly influenced by environmental variation. Limitations still exist regarding the ability to predict both future changes in climate and recruitment rates resulting from a particular climate state.

Therefore, as noted by Parkes (2000) and Hall (1999a), predator-prey models are not considered reliable enough to provide directly applicable management advice at the present time. Hall (1999b) notes that ecosystem-based management advice should move toward setting single-species biological reference points for non-target species, developing single-species reference points for localized regions (i.e., spatially explicit management), and using measures of system-level properties (e.g., species diversity, trophic level of the catch, biomass-size distributions) to derive ecosystem-level reference points.

Food web models of the BSAI, specifically, the eastern Bering Sea shelf, ecosystem have been developed for the 1950s and 1980s (Trites *et al.* 1999). These models use the Ecopath strategy for evaluating mass-balance in marine ecosystems. Ecopath uses estimates of biomass, consumption, diet, and turnover rates of populations or groups of populations to evaluate energy flow and mass-balance in a particular ecosystem (Christensen 1990).

Ecopath creates static biomass flow models of ecosystems and represents a snapshot of the ecosystem for a given time period. Species in these models are linked, so that the biomass transfer resulting from processes such as fecundity, mortality, production, respiration, and predation are in equilibrium (balanced). These types of models provide a way to identify large-scale views of ecosystems and to highlight data gaps (Christensen 1990, 1992, 1994; Pauly and Christensen 1995).

An examination of energy flow within the ecosystem is instructive, although one must be careful in interpreting the inevitable differences among the flow estimates. For instance, although the magnitude of biomass flow from prey to tertiary consumers (e.g., juvenile pollock to seabird predators) is modest relative to that between primary producers and primary consumers (e.g., phytoplankton to crustaceans), it may nonetheless play a significant role in the dynamics of the food web (P. Yodzis, University of Guelph, Ontario, Canada, personal communication). Further, if a food web is composed of few, highly connected species in a trophic sense, removal of a predator may yield a larger ecosystem perturbation than a similar removal from an ecosystem with weaker trophic links among many predators and prey (e.g., Pimm 1982).

The Ecopath models for the Bering Sea were initially developed to see if impacts of intensive whale harvesting that occurred in the 1950s and 1960s were sufficient to explain the ecosystem structural changes that were observed in the 1980s, discussed in Section 3.10.1.3 of the PSEIS. The primary removal of energy in both decades was by harvesting whales and pelagic fishes in the 1950s, and pollock in the 1980s. The production estimate for the 1950s simulation showed baleen whales as the dominant ecosystem component. These whales were classed as a midlevel consumer with a trophic level slightly higher than pollock, due to their consumption of squid. The dominant component in the 1980s simulation was pollock, the dominant fishery. There was a slight drop in trophic level of the catch between the two periods, but this was acknowledged to be an artifact of the volume of squid assumed in the diet of the baleen whales. Without this assumption, there was little change in trophic level of harvest. Trophic level of the catch actually increased from the 1950s to the 1980s, if only fish harvests are considered. This would suggest that harvesting in the Bering Sea at present is at a level that has been sustained over long periods. A further result of this simulation was that whale harvests required an estimated 47 percent of net primary production in the Bering Sea in the 1950s. Fisheries of the 1980s, dominated by pollock, required only 6.1 percent of primary production.

Measures of ecosystem maturity show some differences between the two Bering Sea models. The ratio of primary production to respiration, net system production, and the ratio of biomass to throughput indicate a more mature ecosystem state in the 1950s compared with the 1980s. This is due to the assumption that benthic infauna biomass was lower in the 1980s. However, benthic infaunal surveys used to estimate biomass for the two models used different methods and may not be comparable.

Trophic pyramids are similar for the two time periods, and both indicate that biomass and energy flow were distributed fairly well throughout the system. The steep-sided shape of the pyramids indicates that there is a lot of energy flow at lower trophic levels. One system maturity index, the ratio of primary production to total biomass, actually indicates a more mature system in the 1980s relative to the 1950s. However, this was due to assumptions about the change in primary production between the two time periods, for which there is conflicting evidence. Conclusions about system maturity will be premature until trends in primary production and benthic infauna biomass are better understood.

The Bering Sea appears to be more mature than other modeled ecosystems, particularly with regard to total system throughput, which measures the sum of all energy flows in the system. It has ecosystem measures that indicate it has significant strength in reserve, which makes it more resilient or resistant to perturbations compared with other ecosystems.

Ecosim, a forward-looking simulation coupled to Ecopath, was used to project the results of various scenarios. The model was run in either an equilibrium or dynamic mode. The equilibrium mode assumed that the total biomass of the ecosystem remained stable, and as the biomass of one component declined, others were required to increase to balance it. Dynamic models do not have this requirement.

The equilibrium mode of Ecosim was used to examine the results of changes in a species' abundance on interacting groups. The results of the equilibrium model suggest that changes in baleen whale numbers could significantly affect pollock populations, and that increases in sperm whale numbers could yield decreases in the numbers of Steller sea lions through competition. Reducing pelagic fish numbers reduces the numbers of seabirds that feed on them, as well as numbers of Steller sea lions and large flatfish. Increasing fishing pressure on pollock would have little effect on their biomass, and increasing fishing pressure on large flatfish would result in increased Steller sea lion populations through the removal of a competitor.

In a different approach, the dynamic mode of Ecosim was used to look at possible mechanisms involved in the historical marine biomass changes seen between the 1950s and the 1980s. Scenarios used for the dynamic model were a regime shift that resulted in changes in primary production; a commercial fishery simulation to see if fishing whale could account for the observed changes; three pollock fishing scenarios that project into the future; and scenarios which varied the fishery mortalities on pollock and pelagic fishes.

These simulations suggested that commercial harvesting of fish and whales had little likelihood of producing the changes seen in actual pollock populations since the 1950s. The effect of increasing primary production provided a much more realistic change in the pollock population. While most groupings showed increases, Steller sea lions did not.

There are substantial uncertainties about the abundance of small pelagic fish in both time periods and the abundance of pollock in the 1950s model. Low abundance of pollock and higher abundance of small pelagic fish in the 1950s was assumed. However, although non-standardized surveys by the Soviets during the 1950s showed apparently lower pollock abundance, their research on diet composition of groundfish indicated that pollock was a primary prey item of many species. It is possible that pollock may have been more abundant in the 1950s than has been assumed. Further model testing with this change in assumptions should be done.

Another dynamic simulation showed that, contrary to what might be expected, stopping the commercial pollock harvest had a slight negative effect on Steller sea lions. This is because two of the Steller sea lion prey items, small pelagic fish and juvenile pollock, declined when adult pollock increased. Adult pollock are cannibalistic and compete with small pelagic fish for large zooplankton prey in this model. More recent versions of the model, which changed the assumptions regarding recruitment now show that juvenile pollock actually increase under this scenario, but that Steller sea lions still show a slight negative effect. This is presumably because of the assumption of the dominance of small pelagic fish as a prey item of Steller sea lions. Small pelagic fish still decline under the assumption of increasing pollock, because adult pollock compete with them for large zooplankton prey.

In conclusion, these model simulations indicate uncertainty about the biomass of lower trophic level species in the two time periods. It appears that climate-related shifts in lower trophic level production could partly explain the ecosystem changes that occurred between the 1950s and the 1980s. However, the model only captures predation-related recruitment variability and cannot show climate-related variability in recruitment, which is probably much larger. More detailed scenarios that examine the spatial availability of prey will have to be performed to improve our understanding of the complex interaction between fishery removals and predator-prey interactions.

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Chapter 5 Relationship to Applicable Law and Other Fisheries

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) is the primary domestic legislation governing management of the U.S. marine fisheries. The relationship of the Fishery Management Plan (FMP) for Groundfish of the Gulf of Alaska (GOA) Management Area with the Magnuson-Stevens Act and other applicable Federal law is discussed in Section 5.1. The relationship of the FMP to international conventions is addressed in Section 5.2. The relationship of the FMP to other Federal fisheries is addressed in Section 5.3, and to State of Alaska fisheries in Section 5.4.

5.1 Magnuson-Stevens Act and Other Applicable Federal Law

The FMP is consistent with the Magnuson-Stevens Act (16 USC 1851), including the ten National Standards, and other applicable law.

5.2 International Conventions

The U.S. is party to many international conventions. Those that directly or indirectly address conservation and management needs of groundfish in the Gulf of Alaska management area include:

- Convention for the Preservation of the Halibut Fishery of the North Pacific Ocean and the Bering Sea (basic instrument for the International Pacific Halibut Commission – IPHC)

This plan has a most significant relationship to the management of the Pacific halibut fishery that continues to be vested in the International Pacific Halibut Commission. Many of the management measures contained herein are for the expressed purpose of mitigating a severe crisis in the domestic halibut fishery by recognizing a situation in which the trawl fishery (and possibly the sablefish setline fishery) could be a major contributor to declining halibut abundance.

International Pacific Halibut Commission

The IPHC was created to conserve, manage, and rebuild the halibut stocks in the Convention Area to those levels which would achieve and maintain the maximum sustainable yield from the fishery. The halibut resource and fishery have been managed by the IPHC since 1923. The IPHC was established by a Convention between the United States and Canada, which has been revised several times to extend the Commission's authority and meet new conditions in the fishery. "Convention waters" are defined as the waters off the west coasts of Canada and the United States, including the southern as well as the western coasts of Alaska, within the respective maritime areas in which either Party exercises exclusive fisheries jurisdiction. Under the Protocol to the Convention, the Commission retains a research staff and recommends, for the approval of the Parties, regulations regarding: 1) the setting of quotas in the Convention Area, and 2) joint regulation of the halibut fishery in the entire Convention Area under Commission regulations. Neither U.S. nor Canadian halibut fishing vessels are presently allowed to fish in the waters of the other country.

The fishery for Pacific halibut in the GOA is conducted under an Individual Fishing Quota (IFQ) program, in conjunction with the FMP-managed sablefish resource. A realized benefit of the IFQ program is the reduction in halibut bycatch mortality. Much of the longline bycatch of halibut occurred in sablefish fisheries. To the extent that sablefish fishers have halibut IFQ, this halibut is now retained and counted against target quotas.

5.3 Other Federal Fisheries

The North Pacific Fishery Management Council (Council) has implemented four other FMPs in the Alaska exclusive economic zone (EEZ). These FMPs govern groundfish fishing in the GOA, king and tanner crab fishing in the Bering Sea and Aleutian Islands (BSAI), and scallop and salmon fishing in the Alaska EEZ. The relationship of the GOA groundfish FMP with these other management plans is discussed below.

Bering Sea and Aleutian Islands Groundfish FMP

The GOA and BSAI groundfish fisheries are managed in close connection with one another. While many of the same groundfish species occur in both the GOA and BSAI management areas, they are considered to be separate stocks. There is some overlap between participants in the GOA and BSAI groundfish fisheries. Many of the management measures and stock assessment science is similar for the two areas. Management measures proposed for the GOA groundfish fisheries are analyzed for potential impacts on BSAI fisheries.

BSAI King and Tanner Crab FMP

The fishery management units for the BSAI crab FMP and the GOA groundfish FMP do not overlap. Some participants in the BSAI crab fishery also target groundfish in the GOA, and processors may process catch originating from fisheries authorized under both FMPs.

Scallop FMP

There is very little interaction between the scallop FMP and the GOA groundfish FMP. Virtually none of the vessels participating in the scallop fishery target groundfish. The scallop FMP contains sideboard measures constraining AFA pollock fishery participants from participating in the scallop fishery.

Salmon FMP

Pacific salmon are a prohibited species in the GOA groundfish FMP. There is no fishing of salmon allowed in the EEZ, therefore there is no overlap of participants or grounds conflicts. The GOA groundfish FMP does not include management measures to reduce the bycatch of salmon in federal waters.

5.4 State of Alaska Fisheries

The Constitution of the State of Alaska states the following in Article XIII:

Section 2 General Authority. The legislature shall provide for the utilization, development, and conservation of all natural resources belonging to the State, including land and waters, for the maximum benefit of the people.

Section 4 Sustained Yield. Fish, forest, wildlife, grasslands, and all other replenishable resources belonging to the State shall be utilized, developed, and maintained on the sustained yield principle, subject to preferences among beneficial uses.

Section 15 No Exclusive Right of Fishery, has been amended to provide the State the power "to limit entry into any fishery for purposes of resource conservation" and "to prevent economic distress among fishermen and those dependent upon them for a livelihood".

These are the basic tenets by which the natural resources of Alaska are managed.

The management of demersal shelf rockfish is delegated to the State of Alaska under Council oversight, as described in Section 3.8.1. The relationship of the FMP with State of Alaska fisheries is discussed below.

State parallel groundfish fishery

In the Western and Central regulatory areas, a parallel groundfish fishery occurs where the State allows the federal species total allowable catch (TAC) to be harvested in State waters. Parallel fisheries occur for pollock, Pacific cod, and Atka mackerel species, for some or all gear types. Opening state waters allows the effective harvesting of fishery resources because many fish stocks straddle State and Federal jurisdiction and in some cases a significant portion of the overall federal TAC is harvested within State waters. Although the State cannot require vessels fishing inside state waters during the Federal fishery to hold a Federal permit, it can adopt regulations similar to those in place for the Federal fishery if those regulations are approved by the Board of Fisheries and meet State statute. An example of a Federal fishery regulation that was concurrently adopted by the Board of Fisheries is the Steller sea lion protection measures implemented in 2001.

State managed groundfish fishery

State groundfish fisheries also occur exclusively in GOA state waters for Pacific cod, lingcod, sablefish, and rockfish, and are managed by the State of Alaska Board of Fisheries. For some species, the State conducts an independent stock assessment to determine the annual harvest level, however, for Pacific cod, the annual harvest level is determined based on the federal assessment. The Council and the State of Alaska Board of Fisheries work closely together through a joint protocol committee on issues of mutual importance, and usually meet once a year. The Commissioner of the Alaska Department of Fish and Game, or his designee, sits on the Council.

State shellfish fishery

There is no federal fishery for king and tanner crab in the GOA. These species are prohibited in the GOA groundfish fisheries, and must be immediately returned to the sea with a minimum of injury. Area closures have been put in place around Kodiak Island and in Cook Inlet to protect crab habitat from groundfish bottom trawls.

State salmon fishery

Pacific salmonids are prohibited species in the GOA groundfish FMP, and must be immediately returned to the sea with a minimum of injury. Some controversy exists regarding the degree to which salmon bycatch in the groundfish fisheries affects the stability of State salmon runs.

State herring fishery

There is virtually no interaction between the state herring fishery and the GOA groundfish FMP fisheries. Pacific herring are considered a prohibited species in the groundfish fishery, and must be immediately returned to the sea with a minimum of injury.

Subsistence fisheries

Subsistence fisheries in Alaska are managed by the State, and take place primarily in State waters. Groundfish fishery participants and fishing communities engage in subsistence activities, however groundfish are a minor target of subsistence fishing (see Section 4.3.3 for a description of the subsistence groundfish fishery). Where appropriate, subsistence groundfish harvests are accounted for in annual groundfish stock assessment.

Chapter 6 References

This chapter contains references that may assist the reader in evaluating the FMP. Section 6.1 describes the sources of available data regarding the Gulf of Alaska (GOA) groundfish fisheries, including annually updated reference material. Section 6.2 provides management and enforcement considerations for the GOA groundfish fisheries. A list of the literature cited in the FMP is included in Section 6.3.

6.1 Sources of Available Data

Although every effort is made to keep the FMP updated with recent descriptions of the stocks and fisheries, the availability of new data far exceeds the ability of the North Pacific Fishery Management Council (Council) and National Marine Fisheries Service (NMFS) to amend the FMP. As a result, in some cases, it may be more expeditious to access the regularly updated reference material directly in order to gain a current picture of the status of the groundfish fisheries. The Council (Section 6.1.1), NMFS Alaska Fisheries Science Center (AFSC) (Section 6.1.2), and NMFS Alaska Region office (Section 6.1.3), each produce an abundance of reference material that is useful for understanding the groundfish fisheries. The sections below provide an overview of the types of reports and data available through the various organizations and their websites.

6.1.1 North Pacific Fishery Management Council

6.1.1.1 Stock Assessment and Fishery Evaluation Report

The *Stock Assessment and Fishery Evaluation* (SAFE) report is compiled annually by the GOA Groundfish Plan Team, which is appointed by the Council. The sections are authored by AFSC and State of Alaska scientists. As part of the SAFE report, a volume assessing the *Economic Status of the Groundfish Fisheries off Alaska* is also prepared annually, as well as a volume on *Ecosystem Considerations.*

The SAFE report provides information on the historical catch trend; estimates of the maximum sustainable yield of the groundfish complex, as well as its component species groups; assessments on the stock condition of individual species groups; assessments of the impacts on the ecosystem of harvesting the groundfish complex at the current levels given the assessed condition of stocks, including consideration of rebuilding depressed stocks; and alternative harvest strategies and related effects on the component species groups.

The SAFE report annually (or biennially for some species) updates the biological information base necessary for multispecies management. It also provides readers and reviewers with knowledge of the factual basis for total allowable catch (TAC) decisions, and illustrates the manner in which new data and analyses are used to obtain individual species groups' estimates of acceptable biological catch and maximum sustainable yield.

Copies of the most recent SAFE reports are available online (see below), and by request from the North Pacific Fishery Management Council, 605 W. 4th Avenue, Suite 306, Anchorage, Alaska, 99501.

6.1.1.2 Website

Much of the information produced by the Council can be accessed through its website, to be found at:

http://www.fakr.noaa.gov/npfmc

The information available through the website includes the following.

- FMPs: summaries of the FMPs as well as the FMPs themselves are available on the website.
- Meeting agendas and reports: annual quota specifications, amendments to the FMPs or implementing regulations, and other current issues are all discussed at the five annual meetings of the Council. Meeting agendas, including briefing materials where possible, and newsletter summaries of the meeting are available on the website, as well as minutes from the meetings.
- Current issues: the website includes pages for issues that are under consideration by the Council, including amendment analyses where appropriate.

6.1.2 NMFS Alaska Fisheries Science Center

Much of the information produced by the AFSC can be accessed through its website, to be found at:

http://www.afsc.noaa.gov/

The information available through the website includes the following.

- Species summaries: a summary of each groundfish species is available online, including AFSC research efforts addressing that species where applicable.
- Issue summaries: a summary of major fishery issues is also available, such as bycatch or fishery gear effects on habitat.
- Research efforts: a summary of the research efforts for each of the major AFSC divisions is provided on the website.
- Observer Program: the homepage describes the history of the program and the sampling manuals that describe, among other things, the list of species identified by observers.
- Survey reports: the groundfish stock assessments are based in part on the independent research surveys that are conducted annually, biennially, and triennially in the management areas. Reports of the surveys are made available as NMFS-AFSC National Oceanic and Atmospheric Administration (NOAA) Technical Memoranda, and are available on the website; the data maps and data sets are also accessible.
- Publications: the AFSC Publications Database contains more than 4,000 citations for publications authored by AFSC scientists. Search results provide complete citation details and links to available on-line publications.
- Image library: the website contains an exhaustive library of fish species.

6.1.3 NMFS Alaska Region

6.1.3.1 Programmatic SEIS for the Alaska Groundfish Fisheries

Published in 2004, the *Final Programmatic Supplemental Environmental Impact Statement for the Alaska Groundfish Fisheries* (NMFS 2004) is a programmatic evaluation of the GOA and Bering Sea and Aleutian Islands (BSAI) groundfish fisheries. The document includes several alternative management policies for the fisheries, and provides the supporting analysis for Amendment 74 to the GOA FMP, which changed the FMP management policy.

The document contains a detailed evaluation of the impact of the FMP on groundfish resources, other fish and marine invertebrates, habitat, seabirds, marine mammals, economic and socioeconomic considerations,

and the ecosystem as a whole. The impacts are evaluated in comparison to a baseline condition (for most resources this is the condition in 2002) that is comprehensively summarized and includes the consideration of lingering past effects. Additionally, sections of the document describe the fishery management process in place for the Alaska federal fisheries, and the changes in management since the implementation of the FMP in 1978.

6.1.3.2 Website

Much of the information produced by NMFS Alaska region can be accessed through its website, to be found at:

http://www.fakr.noaa.gov/

The information available through the website includes the following.

- Regulations: the FMP's implementing regulations can be found on the Alaska region website, as well as links to the Magnuson-Stevens Act, the American Fisheries Act, the International Pacific Halibut Commission, and other laws or treaties governing Alaska's fisheries.
- Catch statistics: inseason and end of year catch statistics for the groundfish fisheries can be found dating back to 1993, or earlier for some fisheries; annual harvest specifications and season opening and closing dates; and reports on share-based fishery programs (such as the individual fishing quota program for fixed-gear sablefish).
- Status of analytical projects: the website includes pages for the many analytical projects that are ongoing in the region.
- Habitat protection: maps of essential fish habitat, including a queriable database; status of marine protected areas and habitat protections in Alaska.
- Permit information: applications for and information on permits for Alaska fisheries; data on permit holders.
- Enforcement: reports, requirements, and guidelines.
- News releases: recent information of importance to fishers, fishery managers, and the interested public.

The NMFS Alaska region website also links to the national NMFS website, which covers national issues. For example, NMFS-wide policies on bycatch or improving stock assessments, may be found on the national website. Also, NMFS produces an annual report to Congress on the status of U.S. fisheries, which can be accessed from this website.

6.2 Management and Enforcement Considerations

This section provides information about management and enforcement of the groundfish fisheries off Alaska. Management and enforcement responsibilities include the following:

- Data collection, research, and analysis to prepare annual stock assessments;
- The annual groundfish specifications process through which TAC limits and prohibited species catch (PSC) limits are established;

- The ongoing process of amending the FMPs and regulations to implement fishery management measures recommended by the Council or NMFS;
- Monitoring of commercial fishing activities to estimate the total catch of each species and to ensure compliance with fishery laws and regulations;
- Actions to close commercial fisheries once catch limits have been reached; and
- Actions taken by NMFS Enforcement, the U.S. Coast Guard (USCG), and NOAA General Counsel to identify, educate, and, in some cases, penalize people who violate the laws and regulations governing the groundfish fisheries.

Management of the groundfish fisheries in the GOA and enforcement of management measures governing those fisheries comprise a complex system for overseeing fisheries that range geographically over an extensive area of the GOA and North Pacific Ocean.

NMFS manages the fisheries off Alaska based on TAC amounts for target species and PSC amounts for species that may not be retained. The TAC and PSC amounts are further subdivided by gear type, area, and season. As the complexity of the management regime has grown, the number of TAC and PSC subdivisions has grown as well. For example, in 1995 for the BSAI there were 40 TAC allocations, 38 PSC allocations and two community developm ent quota (CDQ) allocations. In 2003 for the BSAI, there were 152 TAC allocations, 78 PSC allocations, and 34 CDQ allocations. Each allocation represents a possible need for NMFS to take management actions, such as closing fisheries, reallocating incidental catch amounts, or investigating overages. When a directed fishery in one area is closed, the boats that participated in the fishery often move to another area or change to another target. This, in turn, often leads to the need for additional management actions.

Though the number of allocations has increased, the overall amount of fish harvested has not, and NMFS is required to manage increasingly small blocks of fish. To do this adequately requires the use of increasingly sophisticated catch-monitoring tools, such as observer coverage, electronic reporting, vessel monitoring systems, and the use of at-sea scales. Though these tools increase the quantity, quality, and timeliness of the data available to NMFS management, they also increase the demands on staff to effectively make use of a larger and more complex data system.

Current fishery management recognizes that a meaningful enforcement program must accompany management measures for them to be effective. As management becomes more complex, the difficulty of adequately enforcing the regulations grows. As the size and complexity of the regulatory environment increases, the burden on enforcement personnel to fully understand the nuances and implications of regulations increases as well. NMFS/Alaska Region enforcement maintains approximately 36 agents and officers stationed in nine Alaskan ports for monitoring groundfish landings: Juneau, Anchorage, Dutch Harbor, Homer, Ketchikan, Kodiak, Petersburg, Seward, and Sitka. In addition, enforcement personnel regularly travel to other Alaskan ports to monitor landings and conduct investigations. Enforcement personnel associated with NMFS Northwest Region assist in the monitoring of Alaska Region groundfish harvest, primarily individual fishing quota (IFQ) sablefish, landed at ports in the Northwest Region. Also, USCG personnel conduct enforcement activities, monitor vessel activity, conduct at-sea boardings and aircraft overflights, and assist NMFS enforcement personnel in monitoring dockside landings.

A key component of management and enforcement is education and outreach. Complex management programs are accompanied by a regulatory structure that can be difficult for the fishing industry to understand and comply with. This is exacerbated when regulations change rapidly. When fishermen believe that regulations are unduly burdensome or unnecessary, they are less likely to comply voluntarily. Thus, successful implementation of the regulations is dependent on outreach programs that explain the goal of

regulations and why they are necessary. NMFS Management, NMFS Enforcement, and the USCG all conduct extensive outreach and education programs that seek not only to explain the regulations, but to help the fishing industry understand the rationale for those regulations.

6.2.1 Expected Costs of Groundfish Management

Estimates of the costs of BSAI and GOA groundfish management are summarized in Table 6-1 below. For reasons discussed in the table, it has not been possible to make accurate estimates of exact expenditures on groundfish management, nor, in some cases, to distinguish between the two groundfish fisheries. An examination of the Table 6-1 suggests that the GOA and BSAI groundfish fisheries appear to cost the U.S. in excess of $60 million, annually, in management and related research efforts. A larger share of this appears to be spent in the BSAI than the GOA.

A comparison of the costs reported in this section with estimates of revenues generated by the groundfish fisheries does not constitute a cost-benefit analysis of this management effort. There are a number of reasons for this:

- The gross revenues from fishing are not a measure of the value of the commercial groundfish fisheries. On one hand, they ignore the private costs (the opportunity costs of labor and capital) used to catch and process the fish resources. On the other hand, they ignore the appropriate measure of benefits to consumers - the "consumers' surplus" or the value that consumers would be willing to pay for consuming the fish, over and above what they actually have to pay.
- Management costs are only imperfectly identified. Many costs are incurred for multiple purposes, and it is difficult to determine what costs were incurred for which function. Research into ecosystem dynamics may support groundfish management, as well as many other goals. Agency staff often had difficulty determining what portion of an agency budget was spent on groundfish management; staff were often unable to make the even more detailed cost assignment to GOA or BSAI management. This is a problem inherent in the nature of the joint or fixed costs that are often involved. There often simply is no logical way to make these allocations. Even when cost estimates are provided, they are generally very rough approximations.
- The comparison would imply that the management activity was related to the revenues in a specific way. However, specific causal relationships have not been analyzed here. Moreover, even if a causal relationship were implied, it would only be an evaluation of whether or not management at the given level had higher benefits than costs. It would not involve an evaluation of alternative approaches or levels of management. It would thus be of very limited use for policy decisions.
- The BSAI and GOA groundfish fisheries produce a range of social and ecological services beyond the commercial production and consumption of groundfish products. Groundfish support sport and subsistence fisheries and are an integral part of the North Pacific ecosystem. For example, groundfish provide forage for other fish species, seabirds, and marine mammals. The commercial values above only represent one "use" of the groundfish resources.

Table 6-1 presents the estimated cost of groundfish fishery management in a "typical" year in the period 2002-2006. Often the cost estimates are based on operations in the 2003 Federal year, the most recently completed fiscal year at the time the estimates were completed (May 2004). In some instances they incorporate projections; for example, the estimates for the NMFS Alaska Region's Restricted Access Management Program are estimates of anticipated costs following implementation of the new Crab Rationalization Program. Almost all of the agencies listed here have multiple functions. Often an activity - such as a USCG patrol - will carry out a wide range of tasks in addition to supporting groundfish

management. It has therefore often been impossible for agency staff to separate groundfish management costs from overall expenditures, or to separate out GOA and BSAI groundfish management expenditures from groundfish expenditures. Where agency staff did not feel they had a basis on which to make an estimate, no estimate has been provided. In general, estimates are provided to the hundred thousand dollar level. This convention may reasonably approximate costs in some instances where budgets are relatively small and well defined criteria exist for making estimates. In other instances, the reader should be aware that they may provide an undue sense of precision. In general, these estimates are very rough.

The general procedure has been to get budget information from the various departments and to allocate that to groundfish, GOA groundfish, and BSAI groundfish drawing on agency expertise. There are a number of problems inherent with this process. Many activities produce multiple outcomes and it is difficult or impossible to assign their costs to one of those outcomes. Often there is no clear bright line between fishery management activities and other activities. In many cases, the appropriate criteria for allocating costs to one activity or another were not well defined. Much of this analysis depends on the judgement of agency analysts, and the use of different analysts for each agency means that differing judgements might have been used by different agencies. For all of these reasons, the reader should be aware that these estimates can only be treated as rough approximations.

Table 6-1 Estimated cost of fishery management by government agencies. Estimates are expressed in millions of dollars. Note: These estimates are rough approximations.

Agency	Function	Overall Alaska region expenditures	Groundfish fisheries	GOA	BSAI
North Pacific Fishery Management Council	The Council is one of eight regional councils established by the Magnuson Fishery Conservation and Management Act in 1976 (which has been renamed the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act)) to oversee management of the nation's fisheries. With jurisdiction over the 900,000 square mile Exclusive Economic Zone (EEZ) off Alaska, the Council has primary responsibility for groundfish management in the GOA and BSAI, including cod, pollock, flatfish, mackerel, sablefish, and rockfish species harvested mainly by trawlers, hook and line longliners and pot fishermen. The Council also makes allocative and limited entry decisions for halibut, though the U.S. - Canada International Pacific Halibut Commission is responsible for conservation of halibut. Other large Alaska fisheries such as salmon, crab and herring are managed primarily by the State of Alaska. The Council budget is about $3 million, annually. Staff reports that groundfish takes about 80% of their effort, with a 1 to 2 ratio of GOA to BSAI concerns.	$3.0	$2.4	$0.8	$1.6

Agency		Function	Overall Alaska region expenditures	Groundfish fisheries	GOA	BSAI
National Marine Fisheries Service (Alaska Region)			Estimates below by division			
	Sustainable Fisheries Division (SFD)	The SFD implements the intent of the Council and NMFS approved management programs consistent with the Magnuson-Stevens Act and other applicable law. SFD coordinates with the State of Alaska on the development of management programs, including halibut subsistence, and the International Pacific Halibut Commission on the development of regulations governing the Pacific halibut fishery off Alaska. SFD collects and manages catch data from North Pacific groundfish fisheries, develops and maintains information systems for integrating catch and observer data for estimating species specific total catch and uses those data to manage fisheries in an orderly and safe manner while maintaining harvest amounts within specified total allowable catch and prohibited species catch limits. SFD staff provides current and historic fishery statistics to other government agencies and the public, maintaining the confidentiality of protected statistics; and providing guidance to the Council and other management agencies on implementation and monitoring considerations of proposed management measures. The SFD administers and manages the Western Alaska Community Development Quota Program so that allocations of groundfish, crab, and halibut quotas to the CDQ groups are accomplished consistent with applicable law and are harvested within established administrative and fishery management regulations to provide the maximum economic benefits to western Alaska communities.	$3.6	$2.9	$0.9	$2.0
	Protected Resources Division (PRD)	The PRD is responsible under the Endangered Species Act (ESA) for consultations on Federal actions that may affect listed marine mammal species for which NMFS has trust responsibility. NMFS is also responsible for recovering listed protected species to the point that they are no longer in danger of extinction and may be removed from listing under the ESA.	$2.2	$0.8	No estimate provided	
	Habitat Conservation Division (HCD)	The HCD carries out NMFS' statutory responsibilities for habitat conservation in Alaska under the Magnuson-Stevens Act, Fish and Wildlife Coordination Act, National Environmental Policy Act (NEPA), Federal Power Act, and other laws. HCD has two principal programs: identification and conservation of Essential Fish Habitat (EFH) through fishery management, and environmental review of non-fishing activities that may adversely affect EFH or other habitats for living marine resources. HCD also supports habitat restoration projects in conjunction with the NMFS Restoration Center. HCD has staff located in the Alaska Regional Office in Juneau and a field office in Anchorage.	$1.6	$0.4	$0.2	$0.2
	Restricted Access Management (RAM)	RAM implements the Alaska Region's licensing and permitting programs. Specific duties within that broad mandate include calculation and issuance of IFQ permits in the halibut and sablefish IFQ program, together with annual issuance of related permits and licenses, cost recovery activities mandated by the Magnuson-Stevens Act, and determinations on applications for transfers, hired skippers, and other program elements. Additionally, RAM oversees implementation of several other licensing programs, including the North Pacific groundfish and crab License Limitation program, the Federal Fisheries and Processing Permit program, and vessel, processor, and cooperative permitting under the American Fisheries Act (AFA). During Federal Year 2003, RAM assumed responsibilities for implementation of the subsistence halibut program.	$1.9	$0.4	$0.3	$0.1

Agency		Function	Overall Alaska region expenditures	Groundfish fisheries	GOA	BSAI
	Other NMFS Alaska Region organizational units: Regional Directorate, Operations, Management & Information	Fulfills a variety of Regional leadership & coordination roles. Includes: workload competence, quality, and management. Information technology support, grants administration, administrative appeals. Finance & logistical support. NEPA coordination & compliance, preparation of NEPA, E.O. 12866, and Reg Flex analyses for other divisions.	$6.2	$3.5	$1.0	$2.5
	Grants administered by the Alaska Region	The Alaska Region dispenses millions of dollars in grants for fishery management administration and research. Grants to the State of Alaska to assist with groundfish related activity are discussed below, under the line for the State of Alaska. In general, there are few other funds distributed for groundfish related projects. Considerable funding is used for marine mammal related projects, and in recent years large sums have been dispensed for Steller sea lion (SSL) research. In Federal Year 2003, total marine mammal related grants were about $13 million, of which about $11 million were for SSL research. While much of this marine mammal work will have implications for groundfish management, it serves many other purposes as well, and cannot be considered primarily a groundfish management cost item. It is therefore not listed in the summary columns.	Grants to the state are described below. No additional significant grants specifically for groundfish.			
Alaska Fisheries Science Center			Estimates below by division			
	Resource Assessment and Conservation Engineering Division (RACE)	RACE conducts fishery surveys to measure the distribution and abundance of approximately 40 commercially important fish and crab stocks in the eastern Bering Sea, GOA, and marine waters off California, Oregon, and Washington. Data derived from these surveys are analyzed by Center scientists and supplied to fishery management agencies and to the commercial fishing industry.	$17.7	$13.6	$5.8	$7.8
	Resource Ecology and Fisheries Management (REFM)	The REFM Division conducts research and data collection to support management of Northeast Pacific and eastern Bering Sea fish and crab resources. Groundfish and crab stock assessments are developed annually and used by the Pacific and North Pacific Fishery Management Councils to set catch quotas (based on assessments). Division scientists also evaluate how fish stocks and user groups might be affected by fishery management actions.	$11.2	$10.7	$3.2	$7.5
	Auke Bay Lab (ABL)	ABL has housed federal fisheries research in Alaska since 1960. The laboratory is located 12 miles north of Juneau and consists of six research programs.	$12.0	$3.9	$2.9	$1.0
NOAA Office of General Counsel - Alaska Region		The NOAA General Counsel serves as the chief legal officer for NOAA of the U.S. Department of Commerce. The position of the NOAA General Counsel was established in section 2(e)(1) of Reorganization Plan No. 4 of 1970 that created NOAA. The General Counsel is appointed by the Secretary of Commerce, with the approval of the President. The Office of the General Counsel provides legal service and guidance for all matters that may arise in the conduct of NOAA's missions. The Office of the Alaska Regional Counsel (GCAK)s co-located with the Alaska Region of NMFS in Juneau, Alaska. GCAK provides legal advice and assistance on issues related to the administration of NOAA programs in Alaska.	$2.0	No estimates provided		

Agency	Function	Overall Alaska region expenditures	Groundfish fisheries	GOA	BSAI
NOAA Office of Law Enforcement - Alaska Region	NMFS Office for Law Enforcement is dedicated to the enforcement of laws that protect and conserve our nation's living marine resources and their natural habitat. NMFS special agents and enforcement officers have specified authority to enforce over 100 legislative acts under 32 statutes, as well as numerous treaties related to the conservation and protection of marine resources and other matters of concern to NOAA. These are projected Federal Year 2004 costs. They do not include costs of sablefish IFQ enforcement. IFQ halibut and IFQ sablefish enforcement were so interlinked, staff was unable to break out the costs. Total IFQ enforcement expenditures were projected to be $1.73 million.	$5.0	$2.4	$1.8	$0.6
United States Coast Guard - 17th District	The USCG supports the groundfish fisheries by providing at-sea enforcement of all domestic fishery regulations. The numbers provided cannot capture the accurate cost of domestic fishery enforcement. Because all USCG ships and aircraft are multi-mission platforms, counting all fishery resources hours expended will overestimate the cost. The USCG does not conduct patrols that strictly examine fishery regulations nor does any boarding conducted by the USCG look only for compliance with fishery regulations. All federal laws and regulations are enforced on every boarding. Because of that, the true cost of at-sea enforcement is something less than the number provided but a more accurate number is intangible. Many of the resource hours used to build these numbers would have been conducted in the absence of FMP requirements for enforcement. Such patrols would enforce safety regulations and/or drug laws, and interdict alien migration. Currently all of these are being enforced concurrently with fishery regulations. The numbers provided include resources from the USCG budget in Alaska and the Pacific Area headquarters budget. This is necessary because some USCG ships patrolling in Alaska come from the lower 48 or Hawaii, and are not funded from the Alaskan USCG budget. The numbers are therefore not conducive to comparing amount spent on enforcement in Alaska to overall the USCG budget in Alaska.		< $40.2	< $13.9	< $26.3
Alaska Department of Fish and Game (ADF&G)	The groundfish fisheries in the EEZ are a source of jobs and income for many residents of Alaska; groundfish stocks and fishing operations move across the line dividing state from federal jurisdiction; a large proportion of groundfish harvests from the EEZ are delivered to state ports and are recorded on state fish landings records. For all these reasons, the State of Alaska has a significant role in the management of groundfish stocks and fisheries in the EEZ. The state spends money to support the Council process. State managers are particularly important in the management of the demersal shelf rockfish fishery in the eastern GOA. The state spends money on port sampling of groundfish landings, collecting landings records, and data processing and analysis of landings records. The Alaska Board of Fisheries interacts with the Council and considers management proposals to better coordinate federal and state regulations. State ADF&G offices provide local sources of information on EEZ management rules for the public. A significant part of the state's contribution is supported with federal funding. The figure for groundfish represents the value of federal grants awarded to the state. This understates ADF&G expenditures.		>$2.5	No estimates provided	
Other agencies of the State of Alaska	The Alaska Commercial Fisheries Entry Commission processes landings records and Commercial Operators' Annual Reports reports and is an important source for price information for shoreside landings; the Alaska Department of Commerce monitors CDQ group activity and is involved in the process of allocating CDQ among the groups; the Alaska Division of Measurement Standards checks scales for shoreside plants.	No estimate provided			

Agency	Function	Overall Alaska region expenditures	Groundfish fisheries	GOA	BSAI
Fish and Wildlife Service (USFWS)	A representative of the USFWS serves on the Council and on the Ecosystem and Steller Sea Lion Mitigation committees. The USFWS is also represented on the Groundfish Planning Team. USFWS seabird and marine mammal expertise help provide a broader ecological perspective on fisheries management. In addition to long-term seabird and marine mammal population monitoring programs in the GOA and BSAI, USFWS staff are actively engaged with industry and NMFS to develop strategies and technologies to reduce the incidental take of seabirds in groundfish fisheries.	No estimate provided			
Alaska Fisheries Information Network (AKFIN)	AKFIN is a cooperative data program of the Pacific States Marine Fishery Commission, Alaska Department of Fish and Game, Commercial Fisheries Entry Commission, Council, and NMFS. AKFIN transfers, analyzes, and processes agency fishery data for reporting. AKFIN integrates and aggregates all state and federal harvest and value to produce data sets for FMP analyses and reports such as *Fisheries of the US.*	$0.8	$0.7	$0.4	$0.3
North Pacific Research Board (NPRB)	The NPRB's mission is to develop a comprehensive science program of the highest caliber to enhance understanding of the North Pacific, Bering Sea, and Arctic Ocean ecosystems and fisheries. It conducts its work through science planning, prioritization of pressing fishery management and ecosystem information needs, coordination and cooperation among research programs, competitive selection of research projects, increased information availability, and public involvement. The NPRB will seek to avoid duplicating other research. The NPRB expects to support $5 to $6 million in new research each year. Its annual administrative budget is about $0.85 million budget. The groundfish estimate includes NPRB 2003 expenditures for groundfish projects already funded, matching funds provided by grantees, and a third of the agency's annual budget. Costs associated with the NPRB may also be reflected in budgets for other agencies. For example, the ABL has used funds from the NPRB for Aleutian Islands coral investigations. The NPRB reports the $0.8 was expended on this project in 2003, and that there were $0.3 in matching funds.		$5.5	Not estimated	
Costs incurred by the private sector	The private sector incurs costs that could fairly be described as management costs. These include the costs of the paperwork associated with the management system, the private costs associated with the observer program, the costs of operating various cooperative or CDQ catch management programs, and the costs of participating in the Council and regulatory processes[1].	for paperwork: for observers:	$3.7 >$10.8	 > $1.1	 > $9.7

[1] The line between the costs of management and the costs associated with advocacy in the Council process, or with the normal management of an independent business, can be hard to draw. Some of the more important components of this cost item include:

- Costs incurred by private citizens, fisheries organizations, environmental organizations, and other private parties for participation in the Council process.
- Costs of meeting observer requirements (about $10.8 million per year - using 2002 observer days and a cost of $365/day). These provide a low estimate of the total cost of the observer program to fishing operations because fishing operations incur economic and operational impacts that are not directly reflected in the money they must spend on observer coverage. Fishing vessel operators may have to alter their travel plans and schedules to pick up or drop off observers; the observers take up limited space on vessels. Provisions must be made to accommodate the necessary work of the observer on deck (e.g., observing gear setting and retrieval, recording and sampling of catch and bycatch). The observer also occupies "living space" aboard, which otherwise could have housed additional crew members. These operational impacts may be reflected in both increased operating expenses and reduced harvests and revenues. It is not possible, with available information, to quantify these effects, but they may represent a substantial additional cost of operation.
- CDQ groups have significant responsibilities for managing target and non-target quotas. This quota management function may involve personnel and data processing contracts. AFA cooperatives similarly are involved in quota management.
- CDQ groups and AFA cooperatives, and other fishermen, contract with private firms to provide fishing companies with rapidly updated information about the location of PSC bycatch hotspots. Fishing companies are then able to alter their fishing behavior so as to avoid areas with high PSC bycatch. By reducing PSC bycatch, companies are able to extend fishing seasons and avoid other constraints on fishing activity.

- NMFS collects fees from fishermen to offset the costs of managing sablefish IFQ programs. In 2003, NMFS collected an estimated $1.0 million in sablefish cost recovery fees. These costs are already reflected in NMFS spending described above, and should not be counted a second time. However, they do represent a management cost incurred by industry, and are reported here to capture this distributive effect.

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